PHYSIOLOGY AND CALISTHENICS.

FOR

SCHOOLS AND FAMILIES.

BY

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NEW YORK:
HARPER & BROTHERS, PUBLISHERS,
FRANKLIN SQUARE.
1856.

PREFACE.

The following are the distinctive advantages offered in this work:

1. A system of physiology divested of all needless technics. Most school-books on this subject are so encumbered with terms needed only by professional men, as to render them repulsive, and to double the labor both of reading and study. In this work no technical term is employed when a word in common use will express the same idea. Those who prefer the hard words can collect them and give them as a separate lesson.

2. A *short*, *easy*, and *comprehensive course* of physiology and hygiene. There are thousands of the curious and wonderful contrivances of the human body that must be omitted. The proper rule for selection is to take those that can be made *practical* in enforcing the laws of health and life. It is believed that this work contains a greater amount of this kind of knowledge than any other school-book, and in a much shorter compass.

3. A work that is so popular in form that it will be not only interesting for children to study, but for their parents to read. To effect this, a great portion of this work has been tested with the humblest class of uneducated persons, so as to make it both intelligible and interesting to them. The main hope of the adult generation is through the knowledge that may be carried by the children to their homes, and there rendered practical.

4. A work which, while it is fitted to the comprehension of the young and uneducated, is equally adapted to the wants of the highest class of minds. The students of our colleges and higher professional schools may here find a

text-book that contains, in the shortest compass, all they will find of any important practical use in the most cumbrous tomes of scientific writers.

CALISTHENICS.

This word is pronounced Calis-then′-ics. It is formed by the two Greek words *kalos*, signifying *beautiful*, and *sthenos*, signifying *strength.*

It is the name of a course of exercises designed to promote health, and thus to secure beauty and strength.

Gymnastics, also, are exercises designed to secure health and strength. They ordinarily are more severe than this course, while they require apparatus, and a room set apart for the purpose.

The following are the distinctive advantages offered:

1. This system can be practiced in schools of every description, in the family, in nurseries, in hospitals, and in health establishments, *without apparatus*, and *without a room set apart for the purpose.*

2. It excludes all those severe exercises that involve danger, either from *excess* or from *accidents.* It is maintained that many athletic exercises suited to the stronger sex are not suited to the female constitution. This is a system that contains all that either sex needs for the *perfect development* of the body. Any more severe exercises are useful only for men whose professions require some unusual physical strength or endurance. This method is adapted to mixed schools, so that both sexes can perform them together.

3. This system is arranged on *scientific principles*, with the design of exercising *all* the muscles, and of exercising them *equably* and *harmoniously*. It embraces most of what is to be found in the French and English works that exhibit the system of *Ling*, the celebrated Swedish Professor, whose method has been widely adopted in European schools and universities.

It also contains, in addition, many valuable exercises that have been employed in Health Establishments for the cure of disease and deformities.

4. This system is so illustrated by drawings, and so exactly arranged as to mode and time, that *any* person, young

or old, can practice it without aid from a teacher, and in any place. The members of a family in the parlor, the children in the nursery, the invalid in the chamber, the seamstress and milliner in their shops, the student or professional man in his office, study, or counting-room, can open a window twice or thrice a day, and have all the "fresh air and exercise" needed for *perfect health*, by simply following the directions in this work. In the Introduction to the Calisthenics will be found the benefits to be hoped from the practice of these exercises.

SUGGESTIONS TO TEACHERS IN USING THIS WORK.

THE two grand causes of the ill health and physical deterioration so common are, first, a want of *knowledge* of the construction of the body and the laws of health; and, next, a want of *thought* and *conscience* on the subject.

Multitudes abuse their bodies because they do not know the mischiefs they are perpetrating.

Perhaps as many more go on in courses that they know to be injurious, because these matters are never urged on their attention and conscience as matters of *duty*. All the strong motives of religion and of the eternal world are brought to bear, from the pulpit and at the Sunday-school, to enforce certain duties that are no more important to the best interests of man than those "laws of health" which are so widely disregarded. And yet they are as truly the "laws of God" as any that were inscribed by his finger on tables of stone.

What is needed, then, in every school, is "line upon line, precept upon precept," urged *daily* on the attention and conscience of the young. For this purpose it ought to be the *official* duty of one person to take charge of all that relates to the health and physical training of every collection of the young for education. It is hoped that a time is at hand when *endowments* will be provided to secure this object, as

they now are furnished almost exclusively for the training of the intellectual powers.

The teacher who has charge of the Health Department might give out one lesson a week from this book to the whole school. This should be preceded by a familiar lecture on the subject, *illustrated by specimens.* The most important bones of the body, the windpipe and lungs of some animal, which can be obtained at some market, together with models, drawings, and manikins, should all be presented, to make the lecture interesting and lucid. After such a lecture the youngest child in school could study any lesson in this work intelligently and with interest.

Then half an hour each school session should be set apart for physical training, during which a certain portion of this lesson—say the answers to six questions—should be recited, and then the Calisthenic exercises should follow. A sort of *monitorial recitation* by the aid of the leaders and the sections would save much time for the active exercises.

Each *number one* of the section could hear *number two* recite, and then recite herself in return, while the leaders superintended the recitation. (See p. 40 of Calisthenics.)

In using a common school-room for these exercises, pupils by standing in lines, so that one line will face say *north*, and the line before it face *east*, will find that more room is thus made for the arms.

In some cases a time must be set apart for the whole school to exercise at once. In other cases, while one portion are reciting another portion can attend to these exercises.

In some cases a *weekly* recitation in the Physiology for the whole school will be better than a daily one.

The great struggle will be to bring all the parties concerned—pupils, teachers, parents, and school committees—to take from the time now given exclusively to intellectual training, sufficient to secure the health, strength, and beauty of the physical system.

CONTENTS.

PART FIRST.

PART SECOND.

PART THIRD.

PART FOURTH.

CALISTHENIC EXERCISES.

FIRST COURSE—SCHOOL-ROOM EXERCISES.

SECOND COURSE—HALL EXERCISES.

PHYSIOLOGY AND CALISTHENICS.

LESSON FIRST.

PHYSICAL EDUCATION.

THE design of this book is to teach the methods by which children may be trained *at school*, so as to become healthful, strong, graceful, and good-looking.

You have read often of the Greeks. Some twenty centuries ago they were a small people, in a small country; and yet they became the wisest and most powerful of all nations, and conquered nearly the whole world. And they were remarkable, not only for their wisdom and strength, but for their great beauty, so that the statues they made to resemble their own men and women have, ever since, been regarded as the most perfect forms of human beauty.

The chief reason why they excelled all nations in these respects, was the great care they took in educating their children. They had two kinds of schools—the one to train the minds, and the other to train the bodies of their children. And though they estimated very highly the education of the mind, they still more valued that part of school training which tended to develop and perfect the body.

In the family, too, although the higher classes took care that their children should improve the mind, all, from the highest to the lowest, were earnest in efforts to train the rising generation to have healthy, strong, and beautiful bodies. And when these people met at their national festivals, they not only read or recited history and poetry before these

Questions.—What is the design of this book? Who were the Greeks? For what were they remarkable? What was the reason that they excelled others in the respects mentioned? What is said of their schools? What did they do in their families? What at their national festivals?

great assemblies, but they still more delighted in games and sports, which exhibited the beauty, strength, gracefulness, and skill of the human body.

But the American people have pursued a very different course. It is true that a large portion of them have provided schools for educating the minds of their children; but instead of providing teachers to train the bodies of their offspring, most of them have not only entirely neglected it, but have done almost every thing they could do to train their children to become feeble, sickly, and ugly. And those who have not pursued so foolish a course, have taken very little pains to secure the proper education of the body for their offspring during the period of their school life.

In consequence of this dreadful neglect and mismanagement, the children of this country are every year becoming less and less healthful and good-looking. There is a great change in reference to this matter within the last forty years. In former times the children in school-houses, or on Sunday in the churches, almost all of them had rosy cheeks, and looked full of health and spirits. But now, the children in churches and schools, both in city and country, a great portion of them, either have sallow or pale complexions, or look delicate or partially misformed.

The children of the former generation could go out in all weathers, were not harmed by wetting their feet, would play on the snow and ice for hours without cloaks or shawls, and never seemed to be troubled with the cold. And the tender parents of these days would be shocked to see how little clothing was worn in the bitterest cold of winter.

But now, though parents take far more pains to wrap up their little ones to save them from the cold and wet, the children grow less and less healthy every year. And it is rare to find a school-room full of such rosy-cheeked, strong, fine-looking children as were common thirty years ago.

Every year more and more complaints are made of the poor health that is so very common among grown people,

Questions.—What has been the course of the American people? What have been the consequences? What is said of the looks of children in former and present times? How were children clothed in former times, and how in present times? What is said of the health of women and children at the present time?

especially among women. And physicians say that this is an evil that is constantly increasing, so that they fear, ere long, there will be no healthy women in the country.

At the same time, among all classes of our land, we are constantly hearing of the superior health and activity of our ancestors. Their physical strength, and their power of labor and endurance, were altogether beyond any thing witnessed in the present generation.

Travelers, when they go to other countries, especially when they visit England, from whence our ancestors came, are struck with the contrast between the appearance of American women and those of other countries in the matter of health. In this nation it is rare to see a married woman of thirty or forty, especially in the more wealthy classes, who retains the fullness of person and freshness of complexion that mark good health. But in England, almost all the women are in the full perfection of womanhood at that period of life.

Now it is a fact that the health of children depends very much on the health of their parents. Feeble and sickly fathers and mothers seldom have strong and healthy children. And when one parent is well and the other sickly, then a part of the children will be sickly and a part healthy.

Thus the more parents become unhealthy the more feeble children will be born. And when these feeble children grow up and become parents, they will have a still more puny and degenerate offspring. So the case will go on, from bad to worse, with every generation. What then, if these things be true, are the prospects of this nation, unless some great and radical change is effected?

Such a change is possible. The American people have far better advantages than the Greeks had to train their offspring to be strong, healthful, and beautiful. It is true the Greeks had a climate that enabled them to pass most of their time in the open air, to which they owed much of their fine health and beauty.

Questions.—What is said of the appearance of American women compared with those of England? On what does the health of children very much depend? What is the effect on their offspring when one or both parents are unhealthy? To what did the Greeks owe much of their health and beauty?

But we have other advantages which they had not, and in this matter of pure air there is nothing to prevent every man, woman, and child in the nation from enjoying it, both by day and by night, but a want of knowledge of its importance, and a want of proper care to secure it. The Creator has spread this life-giving, beautifying element all around us, and so abundantly, that it can not be kept from our skin and lungs except by constant care and effort. Pure and cool air and water are the two best friends of man, and yet there is nothing that is so much shunned and feared by a great majority of our nation.

It is not the ancient Greeks alone that have excelled us in the physical education of their children. In most of the European nations the best educated people give far more attention to this matter than Americans do. And in some countries a system of physical training has been introduced into schools, which far exceeds any thing practiced in this nation.

The kingdom of Sweden first took the lead in this improvement, under the guidance of a distinguished philanthropist by the name of *Ling*. He was the orphan son of a poor clergyman, and was first distinguished by his genius and perseverance in acquiring a superior education on the most liberal scale. Being afterward employed as master of fencing, he took up the profession in a scientific view, and directed special attention to anatomy, physiology, and connected sciences, in order to perfect a system of exercises in harmony with nature. He assumed the principle of never adopting any movement till he could detect its exact effects on the whole organism, and apply it to use scientifically. By this process he finally evolved a system which aims in the first course to develop equally and perfectly the human form, and in the second place to remedy both deformity and disease.

After many years of trial and persevering efforts, this humble youth became distinguished at the court of Sweden

Questions.—Had the Greeks any advantages that the American people can not secure if they will take proper pains to do so? What is said of air and water? What is said of the European nations on this subject? What is said of Sweden? Who was Ling, and what is his history?

as a public benefactor. He was knighted, and appointed professor and head of a public institution for preparing teachers to propagate his system. Several years ago it was introduced into all military academies, universities, colleges, town-schools, country-schools, and orphan-asylums of Sweden. And such were the results that the system has been carried into several other European nations under the authority of their governments.

A lady who has recently returned from Russia stated that at St. Petersburg she saw nine hundred of the daughters of the princes and nobles of Russia in one institution, where they were trained, by such methods, to be healthful, graceful, and beautiful.

She saw them performing their exercises, and says she never met together so many noble, beautiful, and healthful-looking girls.

It is the object of this work to introduce into American schools a similar system of physical training, to promote grace, health, strength, and beauty.

But in order to secure obedience to the directions that will be given, and the practice of the exercises provided, it is necessary that parents, teachers, and children should understand the construction of the human body, and the manner in which its various internal operations are performed.

For unless *the reasons* for all these rules and exercises are plainly set forth, children can not be made to feel any interest in the matter, nor will parents and teachers be able to induce them to pursue this course of training. These reasons can be understood only by a knowledge of the construction and uses of the various organs of the human body.

The first part of this work will consist of a description of the various organs of the human body and of their uses.

The second part will present the rules for the proper treatment of these organs and the laws of health.

In the third part there will be some account given of the

Questions.—What is said of the Russian institution for the daughters of nobles? What is the object of this book? What is necessary in order to secure obedience to the directions given? What will be the difficulty if the reasons for these directions are not set forth? How is the only way in which these reasons can be understood? Of what is the first portion of this book to consist? What the second? Third?

manner in which these laws are often violated, and the evil consequences that follow.

In the fourth part will be given a system of *calisthenic exercises*, designed to strengthen every part of the body, and to promote health, gracefulness, and beauty.

In the last portion will be taught certain methods for curing disease and deformities by means of these exercises.

Questions.—Of what is the fourth portion of this book to consist? What the last?

LESSON SECOND.

ORGANS THAT SUPPORT THE BODY.

In this lesson will be described those organs of the body which are its foundation and support. These are *the bones*. There are two hundred and eight of them, besides the teeth.

There are no more curious and beautiful contrivances in nature than the bones of the human body. They are made of beautiful materials, the most solid portions being like ivory, and the cartilages and muscles of equally fine construction. Then they are united together with so much skill and curious contrivance as to be subjects for constant admiration. It is a great pity that so many have been trained to look upon them with very different feelings. But as refinement and cultivation increase, such feelings will pass away.

On the two succeeding pages are drawings (*Fig.* 1 and *Fig.* 2) which exhibit the front and back view of the human skeleton. The questions connected with them should be studied before proceeding farther.

The bones are composed of both animal and earthy materials. The animal part gives them life, and the earthy part gives strength. Throw a bone into a fire and the animal part burns out, and what remains is the earthy part, called *lime*. Put a bone into sulphuric acid and water (one part acid and six parts water), and in a few days the acid will remove the earthy part, and what remains will be the soft animal part, which will still retain the shape of the bone.

In infancy the animal part of the bone predominates, and thus children can fall with less danger than grown people, as their bones bend instead of breaking. As age increases,

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Questions.—What is described in this lesson? How many bones are there? What is said of the construction and beauty of the bones? Of what two materials are the bones composed? How can you separate them? What is the difference between the bones of children and old people?

Fig. 1.



a a the spine.
y y the collar-bone.
x the breast-bone.
r r the ribs.
b b the upper bone of the arm.
c c and *d d* the two lower bones of the arm.
f f bones of the hand.
g g bones of the fingers.

s s pelvic bones.
w the sacrum.
h h hip joint.
i i upper bone of the leg.
l l knee pan.
k k knee joint.
n n and *m m* lower bones of the leg.
o o ankle joints.
p p bones of the foot.

Questions.—What letter points out the spine? the collar-bone? the breast-bone? the ribs? the upper bone of the arms? the two lower bones of the arm? the bones of the hand? the bones of the fingers? the pelvic bones? the sacrum? the hip joint? the upper bones of the leg? the knee pan? the hip joint? the lower bones of the leg? the ankle joints? the bones of the foot?

Fig. 2.



Questions.—Which are the shoulder blades? To what are the arms fastened? To what is the shoulder blade fastened? [*Ans.* To the collar bone and to large muscles of the back.] Which is the pelvis? the sacrum? the hip joint?

when more caution is gained and more strength is needed, the earthy portion is increased, while in old age it so predominates as to make the bones brittle.

The bones are covered with a thin skin or membrane, filled with small blood-vessels which convey nourishment to them.

Where the bones unite with others to form joints, they are covered with *cartilage*, which is a smooth, white, elastic substance. This enables the joints to move smoothly, while its elasticity prevents injuries from sudden jars.

The joints are bound together by strong elastic bands called *ligaments*, which hold them firmly and prevent dislocation.

Between the ends of the bones that unite to form joints are small sacks or bags, that contain a soft lubricating fluid. This answers the same purpose for the joints as oil in making machinery work smoothly, while the supply is constant, and always in exact proportion to the demand.

If you will examine the leg of some fowl you can see the cartilage that covers the ends of the bones at the joints, and the strong white ligaments that bind the joints together. You must notice this the first opportunity you find.

The health of the bones depends on the proper nourishment and exercise of the body as much as any part. When a child is feeble and unhealthy, or when it grows up without exercise, the bones do not become firm and hard as they are when the body is healthfully developed by exercise. The size as well as the strength of the bones, to a certain extent, also depend upon exercise and good health.

The principal bones of the head are the skull and the jaw-bones, with the teeth. The skull consists of several bones, united by little projections called *sutures*, which interlace and hook together. The advantage of this mode of uniting the bones is, that falls and jars will not so easily

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Questions.—By what are the bones covered and nourished? What is *cartilage*, and what is its use to the bones? How are the bones fastened together? What fluid is placed in sacks near the joints, and what is its use? On what does the health of the bones depend? What effect is produced on the bones of children when they grow up with but little exercise? Is the size of the bones affected by exercise? What are the bones of the head? What is said of the bones of the skull, and of the mode of uniting them?

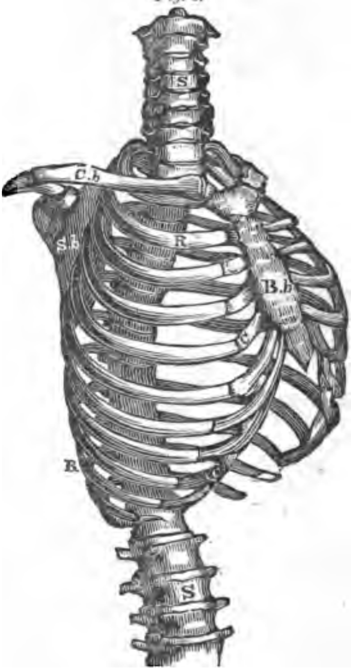
break the skull as if it was one solid piece. These sutures yield somewhat when the head is struck, and thus the bone is not easily broken. They can be seen in *Fig.* 1.

The upper portion of the body is called the thorax, and its bones inclose the heart and lungs. Here is a drawing of it. It consists of the back-bone, marked S; the ribs, marked R; the breast-bone, marked B b; the collar-bone, marked C b; and the shoulder-blade, marked S b.

The ribs are fastened to the spine behind, and to the breast-bone before. The lower ribs are fastened only to the spine. The collar-bones are fastened to the breast-bone at one end, and at the other end, to that point of the shoulder-blade to which the upper bone of the arm is fastened. All these bones are bound firmly together by strong ligaments.

At the bottom of the thorax there is a membrane or skin, made chiefly of muscles, called the *diaphragm.* It is in fact an elastic floor

Fig. 8.



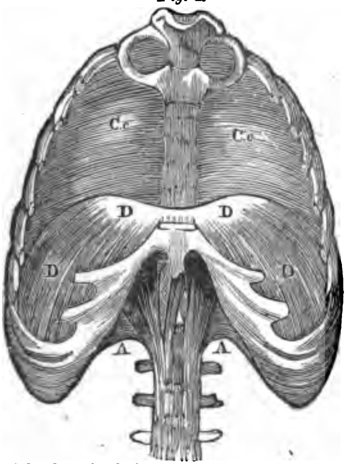
C b the collar-bone, S b the shoulder-blade, B b the breast-bone, S the spine, R the ribs.

Questions.—What is the upper portion of the body called? What are the bones of the thorax? How are the ribs fastened? How are the collar-bones fastened? What is the bottom or floor of the thorax called?

to the thorax, and divides the whole upper part of the body from the lower part. The heart and lungs rest upon it, while the stomach and liver are directly under it. It is fastened in front to the breast-bone, behind to the spine, and at the sides to the ribs. It is also fastened in the centre to the membrane that separates the two lungs.

Its muscles are so contrived that it can be drawn upward, thus pressing upward the heart and lungs. It also can be drawn downward, thus pressing the lower intestines downward. This drawing represents the diaphragm in its most elevated position, the lungs and heart being removed.

Fig. 4.



The front half of the ribs being cut away, the interior of the chest is exposed. C c C c the cavity of the chest, empty. D D D D the diaphragm, rising high in the centre, and descending very low at the sides and behind. The white space is its tendinous portion. The lower part is muscle that contracts to draw it downward. A A the abdomen.

When we inspire the air, the ribs are drawn upward and outward, making the thorax larger in circumference, and the diaphragm, at the same time, is drawn down. When we expire the air, the ribs return to their natural place, while the diaphragm is drawn up, as is seen in *Fig.* 4.

As before stated, the lungs and heart rest on the diaphragm, and are moved up and down when it moves, while the liver, stomach, and spleen lie under it.

Questions.—What rest upon the diaphragm? What are under it? To what is the diaphragm fastened? Describe *Fig.* 4. Which are the muscles that draw the diaphragm downward? How do the ribs move when we breathe?

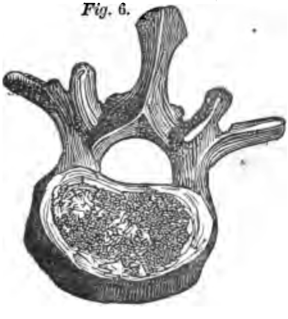
The thorax is the portion of the body which is habitually *trained to deformity* among American women, as much so as is the foot of a Chinese belle. Every possible method (and there are several) is taken to alter its form, until, in a vast number of cases, it becomes almost inverted in its shape, so that what should be the larger becomes the smaller portion. And there are few women in the more wealthy circles whose thorax is of the proper and natural shape and size. The manner in which this monstrous deformity is produced, and then perpetuated through a degenerate offspring, and the evils that result from it, will be shown in another place.

Fig. 5.



The back-bone, or spine, which forms the back portion of the thorax, is one of the most curious contrivances of the body. It is formed of twenty-four small bones, fastened together. When viewed in front

Fig. 6.



Questions.—What is said of the treatment of the thorax? What are the effects of this treatment?

Fig. 7.

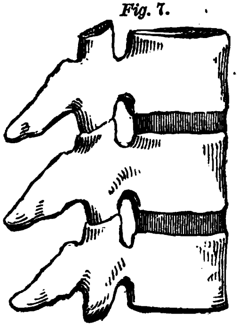


Fig. 8.

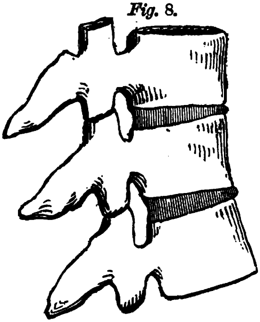
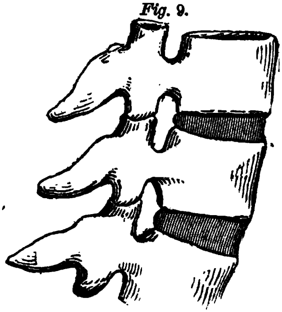


Fig. 9.



it is straight, as you see it in the skeleton, at *Fig.* 2, p. 15.

When it is viewed sideways it is the shape of *Fig.* 5, on previous page. The four small bones at the lower part, marked *f*, are separated in early life, and grow together as life advances.

It will now be shown how the spine is constructed and held in this curving shape. The twenty-four bones of which it consists are of the shape of *Fig.* 6, on previous page, some of them exactly, and others varying a little.—These bones are called the *vertebræ* in the plural. The singular form is *vertebra.*

All the vertebral bones have such a hole as is seen in the drawing, and when placed one above another, they so match that the spinal marrow can run through the opening.

Between the vertebræ are placed *cartilage discs,* which are very curiously contrived and arranged. They are little

Questions.—How is the spine constructed? What are the cartilage discs?

thin cushions, made of cartilage, and placed between each of the vertebral bones. These are elastic, yielding to pressure like India-rubber, and when the pressure is removed resuming their natural form.

Fig. 7 represents two vertebræ; the dark part between them represents the cartilage discs when the spine is in its erect position. *Fig.* 8 represents the appearance of the disc when the spine is bent forward; and *Fig.* 9 is the appearance when it is bent backward. The discs yield in the same way when the spine bends to either side.

The bones of the spine are hooked together by a small projection in the upper one sinking into an opening in the lower one, as is shown by a dotted line in *Fig.* 7. They are also bound together by elastic ligaments, and so strongly, that no bones of the body are so difficult to break or to dislocate as those of the spine.

It is found by measurement, that the pressure of the weight of the body on the discs of the spine during the day diminishes the height of a person quite perceptibly. But the recumbent position during sleep restores the discs to their natural thickness. In this way, every one becomes a little taller in the morning than at night.

The spine is held in its curving shape by means of the cartilage discs, each of which is so formed as to do its part in preserving this form. The curving form and elastic discs save the brain and spine from heavy jars, as it thus can gently yield. When the muscles draw the spine in any direction, the elastic discs instantly will restore it to its right form as soon as the force is removed. Thus is curiously contrived a pillar strong enough to hold up the whole body, which yet can bend every way, and while it is itself crooked, it holds the body erect.

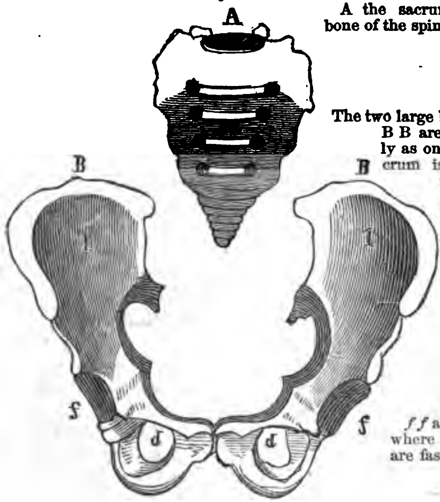
The spine is held in its position not only by the discs, but by ligaments, by strong muscles, and by the close packing of the intestines against it.

The manner in which this beautiful piece of mechan-

Questions.—What is represented by *Figs.* 7, 8, 9? What causes us to be a little taller every morning than at night? How is the spine held in its curving form? What is the benefit from this form and the elastic discs? How do the discs operate when the muscles bend the spine? What else holds the spine in its position?

ism is turned to distortion and deformity will be shown hereafter.

Fig. 10.



A the sacrum, or lowest bone of the spine.

The two large bones marked B B are united firmly as one, and the sacrum is fastened in the opening between 1 1. These all united form the pelvis.

f f are the sockets where the hip bones are fastened.

The lowest bone of the spine, on which all the others rest, is called the *sacrum*, which is represented in *Fig.* 10, at A. The sacrum is inserted into the large bone marked B B, at the open space, and firmly fastened. This large bone, with the sacrum, are the strong foundation bones on which the body rests in a sitting position, and together form what is called the *pelvis*. The spine rests on the sacrum, and the legs are fastened to the sides of the pelvis at *f f*. The portion of the body between the pelvic bones and the diaphragm is called the *abdomen*. The several organs in the abdomen are called the abdominal viscera.

The pelvic organs are the portion of the body the cruel

abuses of which have made them the seat of intense suffering to multitudes of both sexes, but especially to American women.

The methods by which this is done will also be pointed out in another part of this book.

Two drawings that follow will illustrate the manner in which the joints are fastened by ligaments and lubricated.

Fig. 11.

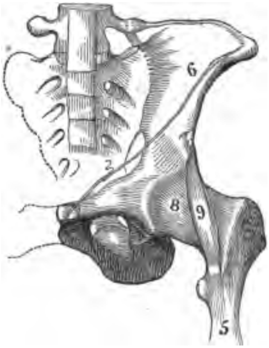


Fig. 12.



Fig. 11.—8, 9, the ligaments that extend from the hip-bone (6) to the femur, or upper bone of the leg (5).

Fig. 12.—2, the socket of the hip-joint. 5, the head of the femur, which is lodged in the socket. 3, the ligament within the socket.

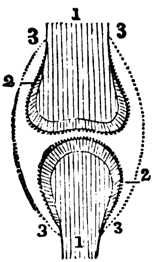
Fig. 11 shows the manner in which the ligaments fasten the thigh-bone to the pelvis; 8 and 9 are two of the largest ligaments, their ends being fastened to the pelvis and the thigh-bone.

Fig. 12 shows the manner in which the hip-joint is fastened into its round, deep socket, by a ligament marked 3. These ligaments are very strong.

Fig. 13 (on following page) shows how the sack is formed that contains the *synovial fluid* that lubricates the joints.

Questions.—Describe *Figs.* 11 and 12.

Fig. 18.



1 and 1 are two bones that form a joint. 2 and 2 are the cartilages enveloping the ends of these bones. 3 and 3 are dotted lines which run from 3 to 3, and also run around the cartilages. These dots represent the membrane that covers each of the cartilages, and then extends up to 3, where it is fastened to the bone, and then descends to the 3 below, and is fastened there to the bone. Thus this membrane is like a close bag laid between the joints, into which oozes the fluid that keeps this membrane soft and moist. Thus the cartilages of the joints do not rub against each other, but have this soft membrane and fluid between. This synovial fluid is always soft and warm, and answers far better than oil does when used to make machinery move smoothly.

Questions.—Describe *Fig.* 13. What is said of the synovial fluid?

LESSON THIRD.

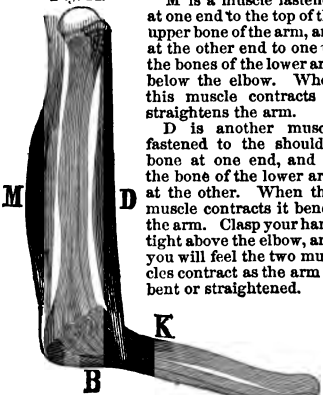
ORGANS THAT MOVE THE BODY.

THE bones give strength and form to the body, but the instruments by which it is moved are *the muscles*. They are what in animals is called the flesh, or meat; meaning, not the fat but the red meat.

The muscles are made of very fine threads, called muscular *fibres*, put side by side, and bound up in a thin skin. All these threads are elastic, so that when they are stretched out they shrink back again like India rubber. Here is a drawing that represents the bones of the arm, and of two muscles which we use in bending and straightening it.

All the flesh around the bones of the arm, that make it look plump, is made of layers of muscles, each bound up in a thin case of skin, and fastened strongly to the bones. They are fitted nicely around the bones, the hollow places are filled with fat to give entire roundness, and then the whole is covered with the strong and smooth outer skin. *Fig.* 15 is a picture of an arm, where the

Fig. 14.



M is a muscle fastened at one end to the top of the upper bone of the arm, and at the other end to one of the bones of the lower arm below the elbow. When this muscle contracts it straightens the arm.

D is another muscle fastened to the shoulder bone at one end, and to the bone of the lower arm at the other. When this muscle contracts it bends the arm. Clasp your hand tight above the elbow, and you will feel the two muscles contract as the arm is bent or straightened.

Questions.—What are the muscles, and how are they made? In *Fig.* 14 what is said of the muscles M and D? Of what is the flesh of the arm made? To what are the muscles fastened? Of what use is the fat portion of the body?

muscles are shown as they appear when the skin is removed. Some of the muscles of the arm are used in turning it, some in lifting it up, some in moving it backward and forward, and some in moving the fingers. Clasp your hand around your arm below the elbow, then shut and open your hand, and you will feel the muscles that move the fingers, some of which open and others shut the hand. Each of the muscles has nerves in it that run to the brain. When we will to move any part, then the brain sends the nervous fluid to the muscles of that part, and this gives them power to move as we choose.

Fig. 15.



In this drawing the muscles marked 5 and 6 are used in moving the wrist. The one marked 8 extends all the fingers; while another, the other side of the arm, closes them. The one marked 9 moves the little finger; 13 moves the thumb; 10 and 14 turn the hand sideways; 15 is the strong band that holds the muscles firmly in place around the wrist.

Many of the muscles terminate at one end in cords called *tendons*, which are very strong, and take up less room than the muscles. You will see these tendons running across your hand when you open or shut it, and you see them in the drawing.

All the muscles of the body are bound around or lapped one over the others, some being one shape, and some another, according to their uses. There are over five hundred of them; and every movement that is made, either within or without, is accomplished by two or more muscles, one set to draw the part

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Questions.—How are the various motions of the arm made? What do the muscles move that are marked 5 and 6 in the drawing? What do the muscles marked 9, 13, 10, 14, and 15 move? What and where are the tendons, and what is their use? How are the muscles of the body arranged, and how many are there? How is every movement of the body made?

one way, and another set to draw it back again. To swallow the food, to draw the breath, to move the eyes or head, to bend the body and to move the limbs, all are done by the muscles.

As before stated, the muscles are made of fine elastic threads bound up in thin cases of skin. But winding in among these threads are multitudes of little vessels through which the blood flows. This blood is made of the food we eat, and is constantly nourishing every part of the body. It is brought from the heart by the arteries, and then is carried back to the heart by the veins, as will be explained more at large hereafter.

At present it is only needful to understand how the muscles are nourished by this blood.

Here is a drawing in which is a small artery, *a*, that brings blood from the heart, and then branches out into multitudes of minute blood-vessels. These are called *capillaries*, or *capillary vessels*. They are so small that they can be seen only by very powerful magnifying glasses. This drawing is a magnified view of what in reality is not so large as a pin-head.

Fig. 16.



The blood enters these capillaries through the artery, and then meanders through them, depositing its nourishing particles where they are needed, and receiving in return the decayed and useless particles. Then it gradually works its way into the vein marked *b*, and then the vein carries it back to the heart. Thus the blood is constantly passing from the arteries into the capillaries, and from the capillaries into the veins.

Now every time we move a muscle, some portion of its substance is changed, decays, and is ready to be carried off.

Questions.—What is winding among the fine threads of the muscles? Of what is the blood made, and what is its use? By what is the blood brought from the heart to the muscles? What carries the blood back to the heart? Describe *Fig.* 16. How much is this magnified? What is the use of the capillaries? What is done by the blood as it passes through the capillaries? What effect is produced whenever we move a muscle?

At the same time this motion hastens the movement of the blood from the artery which nourishes this muscle, so that it may bring a new supply of nourishment and carry off the dead matter. All exercise of the muscles, therefore, is a process for building up that part of the body exercised with fresh materials. And the more the muscle is exercised, the more close and compact it becomes.

Now the peculiar power of the muscle to *contract strongly* depends on the firmness and closeness of the muscular fibre. And this firmness can be acquired only by exercise. A muscle that is used but little has but little blood sent to nourish it, and so it becomes pale and soft, and its elasticity or power to contract is diminished. On the contrary, when muscles are well exercised they become firm and compact, have a bright, healthy color, and their contractile power is increased.

The longer and the faster we exercise the muscles the more their firmness and elasticity are increased until they come to the perfect size and shape. If only a few are exercised, then only a small portion of them are strengthened and purified by quicker action. All the rest receive less nourishment, have less life and elastic power, and are consequently imperfectly developed.

But there is a limit to which the exercise of the muscles must be confined, or the excess will be as injurious as a deficiency in exercise. A muscle may be reduced in size, strength, and elasticity by over-exercise; for in this case the decay made by exercise exceeds the supply of nourishment furnished by the blood. This is the reason why horses and oxen that are overworked grow thin and weak. Their muscles are exercised too much, and the decay of muscle exceeds the supply of nourishment furnished by the blood.

This shows the reason, too, why animals must be well fed when they are to be worked hard. The blood must be

Questions.—Why does exercising the muscles do good to them and to the whole body? What does the power to *contract strongly* in the muscles depend on? How is this gained? What is the effect on the muscles when they are exercised but little? How do muscles that are exercised a good deal appear? What are the consequences if we exercise only a few of the muscles? Can the muscles be too much exercised? What is the effect of too much exercise? Why should animals that work hard be well fed?

supplied with more nourishment from food to furnish the supplies needed by the hard-working muscles that are thus constantly decaying and passing away.

But the capillary vessels are not confined to the muscles. The blood nourishes every part of the body, even to the bones, and therefore every part is supplied with capillaries. There is not a place as large as the point of a needle in our whole body where there are not capillary vessels busily at work in supplying all portions with strength and nourishment.

Exercise not only tends to quicken the movement of the blood in the muscles, but also in all parts of the body. Every portion of the body is decaying and passing away. It is calculated that in about seven years every particle in the body is removed and new matter is supplied instead. Now the more the muscles are used the faster this process proceeds, and the more firmly and purely the body is renewed, provided always the food taken is proper and healthful. Thus the purity and strength of the whole body is dependent on the *proper* exercise of the muscles. If they are exercised too much or too little, debility and emaciation ensue. If they are trained and exercised aright, health, vigor, elasticity, and enjoyment are the result.

Questions.—What is said of the capillaries? What is said of the effect of exercise on the blood and on the whole body? In what time is the whole body changed and renewed? What does the purity and strength of the whole body depend upon?

LESSON FOURTH.

ORGANS THAT CONVEY THE NOURISHMENT OF THE BODY.

We have seen the manner in which the blood *nourishes* the body when passing through the capillaries. The manner in which it is carried to every part for this purpose is very curious and wonderful. But it requires clear explanation and good attention to understand it fully.

These particulars must be well fixed in the mind.

First, the heart sends the blood to all the capillaries through one set of blood-vessels, called *arteries*. Then the blood is brought back to the heart by another set of blood-vessels, called *veins*.

Next, the blood which returns by the veins is impure, and is sent by another set of arteries from the heart into the lungs to be purified by the air we breathe. Then it is brought back to the heart by another set of veins.

Thus there are two sets of arteries and veins, through which the blood is all made to pass; first through the body and back to the heart for the purpose of nourishment, and then through the lungs and back for the purpose of purification.

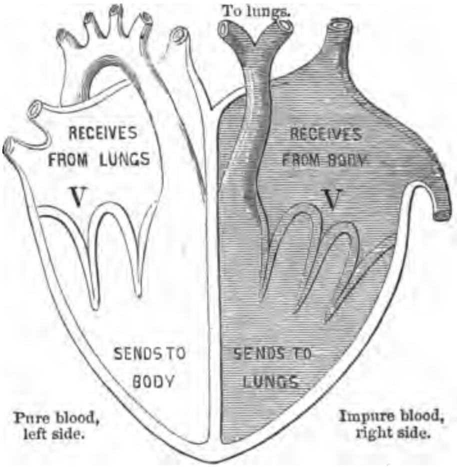
This process is called the *circulation* of the blood.

On the opposite page is a drawing that will show how this is done.

In *Fig*. 17, the *right* side of the heart receives and sends out the *impure* blood. The upper division receives it from the body through two large veins. Then the blood passes to the lower division of the heart, where it is sent to the lungs through one large artery with two branches, one for each lung. This is the *pulmonary artery*.

Questions.—What two particulars must be fixed in the mind? For what are there two sets of veins and arteries? For what does the blood pass through the body? For what does it pass through the heart? What is this process called? What does the *right* side of the heart receive and send out? Which portion of the right side receives the blood and which portion sends it out?

Fig. 17.



The *left* side of the heart receives and sends out the *pure* blood. The upper portion receives it from the lungs through three large veins. Then the blood passes to the lower division of the heart, whence it is sent to the capillaries all over the body through one large artery called the *aorta.*

The points marked V are the *valves* through which the blood passes from the upper to the lower divisions of the heart.

The upper divisions of the heart are called the *auricles,* and the lower ones the *ventricles.*

The heart puts the blood in circulation by its muscles, that contract and make it smaller. First the upper divisions contract and force the blood into the ventricles below. Then

Questions.—What does the *left* side of the heart receive and send out? Which side of the heart receives blood from the body, and which from the lungs? What are the names of the two great arteries, and which carries blood to the lungs, and which to the body? Which are the valves, and what is their use? What are the names of the divisions of the heart? How does the heart put the blood in circulation? What effect is produced when the upper part contracts?

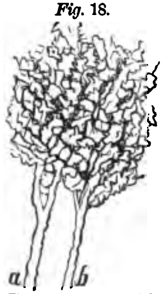
the ventricles contract and send the blood through the aorta all over the body, and through the pulmonary artery into the lungs. As soon as the heart returns to its natural size, the blood flows into the upper divisions, on the right side from the body, and on the left side from the lungs.

Thus the heart, by constantly contracting and then returning to its natural size, produces the circulation of the blood.

The valves are so made that the blood, as it is pressed down by the contraction of the upper divisions, forces them open. But when the pressure of the blood is the opposite way, it closes these valves. Thus, when the upper part of the heart contracts, the valves are forced open and the blood passes down; but when the lower divisions contract, the valves are closed tight, and the only place of exit for the blood is through blood-vessels that convey it to the lungs and the body.

In the drawings of most other books the heart is represented, not as it is in the person holding the book, but as it is in a person opposite. This perplexes the reader, by having the right side of the heart on the left side of the page. The drawing in this book prevents this difficulty, by placing the right side of the heart on the right side of the page, and thus at the right side of the reader.

Fig. 18.

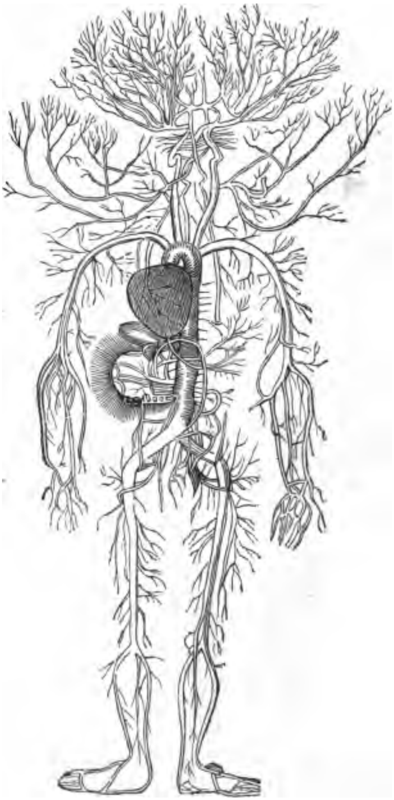


In the lesson on the muscles is a drawing of the capillaries, which is repeated here. There are two kinds of capillaries: those of the body, where the blood is employed in nourishing every part, and those of the lungs, where the blood is purified by the air, as will be explained in the next lesson.

It has been shown that the heart sends the pure blood for nourishment through the aorta. This great artery branches out first into large trunks, two going to

Questions.—What effect is produced when the lower part contracts? How are the valves made, and how do they operate? How is the heart usually drawn in other books, and how is it in this book? How many kinds of capillaries, and how are they employed? What is said of the aorta and its branches?

Fig. 19.

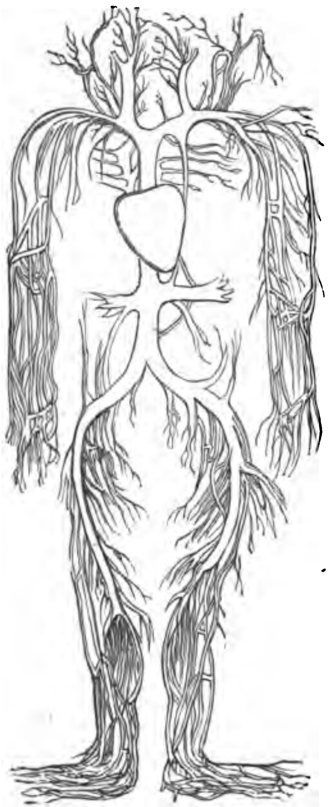


the head, one to each arm, one to each leg, and several to the trunk. These again branch out into smaller arteries, and these into still smaller, and so on, till every part of the body receives a small artery, which terminates in capillaries.

Fig. 19 is a drawing representing, though very imperfectly, the manner in which the arteries branch out. The smallest arteries and their capillaries can not be drawn. As the blood wanders through the capillaries, the particles of nourishment pass out to the points where they are needed, and in their place the blood takes up all the unhealthy and decayed matter, that it may be thrown off.

After this process, the smallest veins receive the blood

Fig. 20.



from the capillaries, and carry it to larger veins. These carry it to still larger, till finally it all is conducted, by the two great veins, to the right side of the heart.

Here is a drawing that represents the system of veins, though very imperfectly. They are spread out more than they are in reality, and the smallest veins and the capillaries are not drawn.

Wherever we find a large artery to carry nourishing blood, near it is as large a vein to carry back the impure blood.

The aorta has valves at its junction with the heart, so contrived that the blood can flow readily the right way; but if it turns back it closes the valves. The veins also have similar valves that prevent the blood from running back the wrong way.

The veins are placed nearest the surface, and the arteries deeper.

The pure blood in the

Questions.—**What does *Fig.* 20 represent? Do the large veins and arteries run near together? Where are valves placed, and for what purpose? Which are nearest the surface, the arteries or the veins?**

arteries is a bright vermilion color. The impure blood in the veins is darker, and more of a purple color. The blood in the arteries flows with regular pulsations corresponding with the beats of the heart; but in the veins it flows in a steady stream.

In a full-grown person there are about thirty pounds, or fifteen quarts, of blood, and every beat of the heart sends out about two ounces, while there are from seventy to eighty heart-beats a minute. Thus in each hour over a hogshead of blood passes through the heart. An amount of blood equal to the whole in the body passes through the heart in from six to eight minutes.

In the extremities and capillaries the blood usually flows slower than elsewhere. Thus, though the heart sends out and receives a hogshead of blood every hour, and has an amount *equal* to the blood of the whole body pour through it every six or eight minutes, it is not true that all the blood of the body passes through the heart thus often, for some portions are returned more frequently than others.

Whenever any part of the body is chilled with cold, the blood retreats from that part, and, of course, accumulates in other organs. The health of the body very much depends upon *equalizing the circulation.* It is probable that in a *perfectly* healthy body the circulation is nearly equal in every part.

The manner in which the exercise of the muscles quickens the circulation of the blood will now be explained.

It has been stated that the veins abound in every part of every muscle, and that the large veins have *valves* which prevent the blood from flowing backward.

If the wrist is grasped tightly, the veins of the hand are immediately swollen. This is owing to the fact that the blood is prevented from flowing toward the heart by this pressure, while the arteries, being placed deeper down, are

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Questions.—What is said of the color and movement of the blood in the veins and arteries? How much blood is there in a full-grown person? How much passes through the heart at every beat? How much every hour? How does the blood flow in the capillaries and extremities? Does all the blood of the body pass through the heart equally often? What is the effect when any part of the body is chilled? What does the health of the body depend upon? Explain the effect that follows the tight grasping of the wrist.

not so compressed, and continue to send the blood into the hand, and thus it accumulates. As soon as this pressure is removed, the blood springs forward from the restraint with accelerated motion.

This same process takes place when the muscles are exercised. The contraction of any muscle presses some of the veins, so that the blood can not flow the natural way, while the valves in the veins prevent its flowing backward. Meantime the arteries continue to press the blood along until the veins become swollen. Then, as soon as the muscle ceases its contraction, the blood flows faster from the previous accumulation.

If, then, we use a number of muscles, and use them strongly and quickly, there are so many veins affected in this way as to quicken the whole circulation. The heart receives blood faster, and sends it to the lungs faster. Then the lungs work quicker, to furnish the oxygen required by the greater amount of blood. The blood returns with greater speed to the heart, and the heart sends it out with quicker action through the arteries to the capillaries. In the capillaries, too, the decayed matter is carried off faster, and then the stomach calls for more food to furnish new and pure blood. Thus it is that exercise gives new life and nourishment to every part of the body.

Questions.—How does using the muscles quicken the flow of the blood? What is the benefit of quickening the circulation?

LESSON FIFTH.

ORGANS THAT PURIFY THE BODY.

WE have seen that the impure blood is sent from the heart to the lungs to be purified. The process by which this is effected will now be explained.

The air we breathe is composed of two invisible gases, called *oxygen* and *nitrogen*. These are always mixed in exactly the same proportions; that is, every hundred pounds of air consists of twenty-one pounds of oxygen and seventy-nine of nitrogen.

There is another gas called *hydrogen*, and when this is united with oxygen it forms *water*. The oxygen can be taken from water, and then the hydrogen that remains burns more readily than any other substance. Many persons think that some day a way will be discovered of separating the hydrogen of water from its oxygen, so that fires and lights can be made by burning the hydrogen.

Carbon is a solid substance. Wood and charcoal consist chiefly of carbon. When oxygen unites with carbon it produces fire with its light and heat.

Almost the whole of our bodies is formed by the combination of *oxygen*, *hydrogen*, *carbon*, and *nitrogen*.

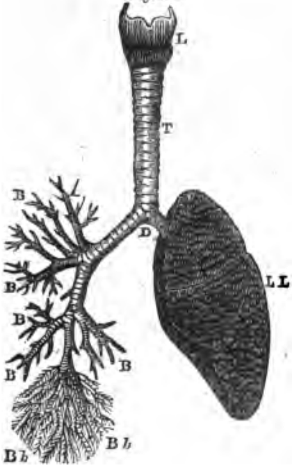
The oxygen of the air has a stronger attraction to some bodies than it has to its own nitrogen; so that, in certain circumstances, it will leave the nitrogen and unite with these bodies. When oxygen unites with carbon, in certain proportions, it forms an invisible gas, called *carbonic acid*. This is heavier than the air, so that, when pure, it can be put in a bowl and poured out like water, and it will then sink to the earth.

Questions.—Of what is the air composed, and in what proportions? Of what is water composed? What is said about hydrogen? Of what four substances are our bodies chiefly composed? How is carbonic acid formed? What is said of its weight?

Carbonic acid, if taken into the lungs instead of air, will destroy life, though it may be mixed with the air in small quantities, and inhaled without immediate injury. It is never the case that the air is perfectly free from a small quantity of this gas.

Having explained the construction of the air, we will now notice that of the lungs. Here is a drawing (*Fig.* 21) which represents the *windpipe* (or *trachea*) and the *bronchial tubes*,

Fig. 21.



L, larynx, or top of the windpipe.

T, windpipe.

D, two branches of the windpipe.

B, B *b*, branches of the windpipe inside of the lungs.

L L, outside of one lung.

which convey air to the lungs, and are branches of the windpipe. These branch out into innumerably fine tubes, each one of which terminates in an air-cell. In this drawing you see the outside of one of the lungs on the right hand, and on the other side you see the branches of the windpipe. Each of these very minute tubes has an air-cell which is supplied with air through the tube. Whenever

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Questions.—What is the effect of carbonic acid if taken into the lungs instead of air? What does *Fig.* 21 represent? What are the names of the several parts? What is done by the windpipe and bronchial tubes?

we inspire the air all these tubes and air-cells should be filled.

The following drawing is an enlarged view of the air-cells which are at the end of the air-tubes that run from the windpipe. *Fig.* 22 shows them as cut open, and *Fig.* 23 presents the outside of them.

Fig. 22.



Air-cells cut open.

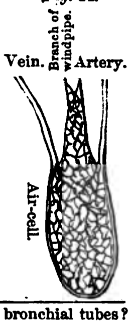
Fig. 23.



Outside of air-cells.

These air-cells are formed chiefly of capillaries, which receive the blood sent from the heart to the lungs. Thus when the air-cell is filled with the air we breathe, it at the same time has its capillaries filled with blood. Thus the air and the blood have nothing but a very thin skin, or membrane, to separate them.

Fig. 24.



Here is a drawing (*Fig.* 24) that represents an enlarged air-cell. It shows how the blood is brought by an artery to the air-cell, and then, after winding through the capillaries, how it flows to the vein which conducts it back to the heart.

Now, it is while the impure blood is thus passing through these capillaries of the air-cells that the process of its purification takes place. The impure part of the blood consists

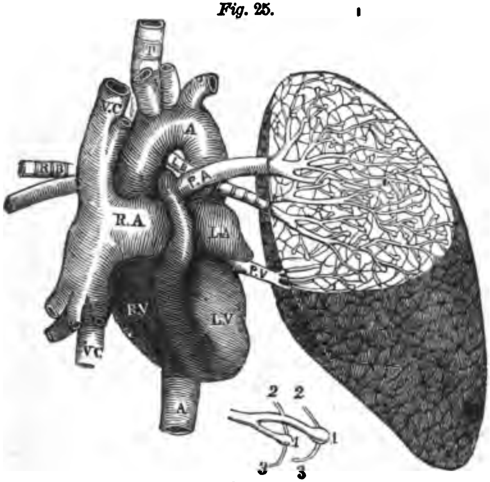
Questions.—What is at the end of the windpipe and bronchial tubes? What is at the end of these tubes? Of what are these cells formed? When these cells are filled with air and the capillaries with blood, what separates them? Explain *Fig.* 24. What kind of blood passes through the capillaries of the air-cells?

chiefly of *carbonic acid.* This acid has a stronger attraction for the air in the cell than for the blood, and so it passes through the thin membrane and unites with the air. At the same time the oxygen of the air has a stronger attraction for the blood than it has for its own nitrogen, and so it also passes through the membrane and joins the blood in the capillaries.

Thus the blood in the capillaries of the air-cells is purified by giving up its carbonic acid to the air, and receiving the oxygen of the air in return. The air expired from our lungs has thus lost a large portion of its oxygen, and received as much carbonic acid in its place.

When the blood comes into the capillaries of the air-cells,

Fig. 25.



A, aorta. T, windpipe. L B, left branch of the windpipe. P A, artery carrying blood to the lungs. P V, vein bringing blood back to the heart.

Questions.—Of what does the impure portion of the blood consist? For what has this acid a strong attraction, and what is the consequence? For what has the oxygen of the air a strong attraction, and what is the result? How, then, is the blood purified? What is said of the air that is expired from our lungs?

it is impure with carbonic acid; when it returns from the lungs to the heart, it is supplied with the life-giving and purifying oxygen.

Fig. 25 (on the opposite page) shows the heart, with parts of its great veins and arteries, and also one of the lungs.

In this drawing of the lung the upper portion, which is light, shows the manner in which the arteries and veins of the lungs carry the blood to and from the heart. The large artery marked P A is the *pulmonary* artery, and its many branches carry the impure blood to the capillaries which form the air-cells; P V represents the pulmonary vein, whose branches bring back the blood from the capillaries of the air-cells to the heart; L B is a branch of the windpipe, and its many branches conduct the air to the air-cells. The lower and dark portion of the lung represents the exterior part. We have now seen how the blood is purified in the capillaries of the lungs. We will now attend to the process which takes place in the capillaries all over the body.

The pure blood is distributed to the capillaries in all parts of the body by the *aorta* and its branches. This blood consists of new *chyle* which the stomach has provided, and the blood which has been purified by giving out carbonic acid and receiving oxygen.

As it passes through the capillaries of the body the oxygen is attracted by the carbon of the decayed portions which need to be removed. This union of the oxygen and carbon produces the carbonic acid which renders the blood dark and impure. The veins collect this impure blood and carry it to the heart. At the same time the fresh chyle of the blood is deposited in place of the decayed matter, which has been thus removed.

Thus, in the capillaries all over the body, the arterial blood imparts oxygen to unite with the decaying particles

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Questions.—How is the blood when it enters the air-cells, and how is it when it returns? What does *Fig.* 25 show? What does the light portion of the lung represent? What is represented by P A, P V, and L B? What does the lower and dark portion of the lung represent? By what is the pure blood sent to the capillaries of the body? Of what does this blood consist? What attracts the oxygen in the capillaries, and what is thus produced?

that are thus turned to carbonic acid, while the new chyle fills up the vacancy.

Meantime the veins draw off the carbonic acid, and carry it to the lungs to be thrown out.

We shall see, in another place, that this union of the oxygen and carbon in the capillaries produces the animal heat which keeps our bodies warmer than the air around us.

The great thing, then, which is indispensable to the purifying of the body is, that the lungs should have a full supply of oxygen. There are two ways in which this is prevented: one is, by the mixture of carbonic acid with the pure air, and the other is, by thinning the air with heat.

We should take about half a pint of air at each inspiration. Now, if a large portion of this is carbonic acid, instead of the pure atmosphere, we lose the same proportion of the needful supply of oxygen at every breath. Heat makes the air thinner, so that there is less oxygen in half a pint of warm air than in the same quantity of cold air. If we breathe warm air, then, less oxygen is obtained than when we breathe cold air.

We have seen how the air is thrown out from the lungs, loaded with carbonic acid, and deprived of its oxygen. As we breathe about twenty times a minute, and use half a pint of air at each breath, it can be seen by calculation that every pair of lungs vitiates one *hogshead* of air every hour. For this reason, it is indispensable to the health of the body that, when we are confined to any room, there should be a gentle but constant current, that shall carry off every hour just as much air as the lungs in that room have vitiated. This is the guide to the rule for ventilating rooms. Just in proportion to the number of persons breathing in a room or house, should be the amount of air brought in and carried out by the arrangements for ventilation.

The membrane that forms the air-cells of the lungs, if

Questions.—What part do the veins and chyle perform? How is animal heat produced? What is indispensable to the purifying of the body? In what two ways is this prevented? How much air should be taken into the lungs at each inspiration? What is the effect of carbonic acid and of heat? How much air does one pair of lungs vitiate every hour? How much air should be removed from a room?

all united and spread out in one sheet, would cover the floor of a room twelve feet square. Every breath that fills the lungs brings a surface of air in contact with this extent of membrane, and then the oxygen of the air and the carbonic acid of the blood change places. This shows more vividly what mischief must ensue when the air inspired is loaded with carbonic acid from other lungs, in place of the pure and life-giving oxygen.

The air can not retain over ten per cent. of carbonic acid. After thus much has been mixed with the air no more can be received; but it sinks and accumulates. Were it not for this the air would be oftener rendered entirely deadly, so that life would cease in great crowds.

It must be remembered that a portion of the oxygen carried from the lungs to the capillaries unites with *nitrogen*, and forms water. This is thrown out, by the lungs and skin, with the carbonic acid.

There are two methods by which the lungs are filled with air; one is, by a rising and outward motion of the ribs enlarging the space around the lungs. Then the air rushes in and fills the air-vessels in the upper portion of the lungs.

The other method is, by the action of the diaphragm and abdominal muscles. The diaphragm, by the contraction of its muscles, is drawn downward, and thus the intestines are pressed downward. This enlarges the space at the bottom of the lungs, and the air fills the air-cells in that portion. Then the muscles of the abdomen contract, and press the intestines upward against the diaphragm, which also moves upward. In this way the air is expelled from the lower portion of the lungs.

There are more air-cells in the lower than in the upper part of the lungs, and for this reason the abdominal breathing is of more consequence than the breathing effected by the ribs.

When the body is perfectly free, and breathing natural,

Questions.—What is the extent of the air-cell membrane? What is said in reference to this extent of membrane in the air-cells? What quantity of carbonic acid can the air hold, and what becomes of the excess? How is water formed in the capillaries, and how is it thrown off? Describe the two methods of breathing. What part of the lungs has the most air-cells?

there is more motion of the abdomen than of the chest in breathing. This may be observed in a healthy young child.

It is important that this should be well understood, as the modes of dress are often such as to stop the abdominal breathing almost entirely, and thus to keep a large portion of the lower cells of the lungs entirely without air.

It is probable that there is more decay of health and strength, in this nation, from the breathing of impure air than from any other cause.

As every minute point in the whole body depends, for its strength and purification, on the oxygen that the air sends to the capillaries, any failure in this affects the whole system slowly but surely. And what makes the evil a peculiarly difficult one to meet, this decay of constitution is so slow and imperceptible that it is never realized.

Questions.—What is a chief cause of decay of health in this nation? How is the evil effected, and why is it a difficult one to meet?

LESSON SIXTH.

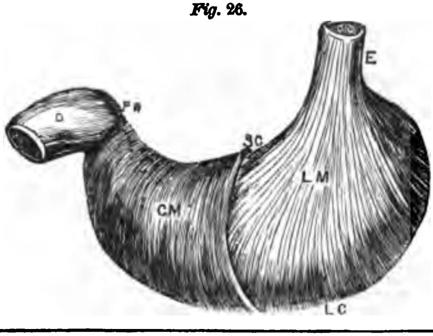
ORGANS THAT PREPARE NOURISHMENT FOR THE BODY.

We have seen how the blood is carried by the arteries from the heart into the capillaries, and that the whole body is nourished by it in these minute vessels. We will now attend to the process by which the blood is manufactured from the food and drink.

The solid portions of food are first divided by chewing, in order to mix it with the *saliva* or spittle. This liquid exudes from small *glands* or bags placed near the sides of the mouth. Its use is to moisten the food, so that it will glide easily down to the stomach, and it also aids in dissolving it.

The stomach is a bag that will hold from a quart to three pints, according to the size and age of a person. Here is a drawing showing its shape.

Fig. 26.



E, the place where food enters.
LM shows the muscular fibres that run one way, and CM those that run another way.
PO is the place where the food passes the valve to meet the bile.

***Questions.*—In turning food to blood what is the first thing done? Where is the saliva, and what is its use? How large is the stomach?**

The stomach has three skins. The outer one is strong and smooth. The middle one consists of muscles, one set running one way and the other set another. In the drawing the outer skin is removed, and at LM are shown one set and at CM the other set. The muscles move the food by constantly contracting and relaxing.

The inner skin consists chiefly of blood-vessels, from which exudes the *gastric juice* furnished by the blood to dissolve the food. The blood-vessels in this inner skin also draw into the blood all water or other liquid that enters the stomach, except what may be needed to keep the food of a proper consistency during the process of digestion.

As soon as food enters the stomach, these muscles begin to contract and relax alternately; making a motion that turns the food over and over, and moves it constantly from one end of the stomach to the other, in order that it may be thoroughly mixed with the gastric juice.

After the food enters the stomach, the veins of the inner skin draw off the superfluous liquids, and then the gastric juice pours into the stomach, and the muscles work with strong and steady action, from two to four hours, until the food is reduced to a thin paste. It then passes through a small *valve*, or door, which opens at the smaller end of the stomach to whatever food is well prepared; but if any comes that is still undigested, this valve closes tight and the food returns till it is properly digested. Should there be food that will not digest, it keeps returning to this valve till its muscles are tired out, and then the undigested mass is allowed to pass through.

After passing this valve (which is marked PO in the drawing) the food receives *bile* from the *liver*, and also the *pancreatic juice* from the *pancreas*, and these two liquids change it into a thinner, whitish liquid called *chyle;* then it passes through the lower intestines.

Questions.—How many skins has the stomach? What is the outer one? Of what does the middle one consist? Describe the drawing. Of what does the inner skin consist? What office do these blood-vessels perform? What follows as soon as the food enters the stomach? How long do the muscles work? Where does the food pass after it is changed to a thin paste? What is done when food is not well digested? After passing the valve what is added to the food, and what effect is thus produced? Through what does the chyle pass?

Fig. 27.

L is the liver.
S s is the stomach.
P is the pancreas, most of it hid.
G B is the gall-bladder that receives the bile.
S is the spleen, most of it hid.
D is the place where the bile and pancreatic juice enter.
S I are the small intestines through which the chyle passes.
L I is the colon, or large intestine, and at its end is the *rectum*, marked R, which is the outlet.



Fig. 27 is a drawing of the organs described, together with the lower intestines, through which the chyle is carried. They are not in their natural position, as they are when packed closely in the body.

The chyle, when prepared, passes through the white, smooth, satin-like intestines, that are about twenty-four feet long, all neatly folded up in the abdomen. On the inside of these intestines are the mouths of very small tubes, called *lacteals*, about the size of a fine hair, which gradually draw off this chyle and carry it to a reservoir called the *thoracic*

Questions.—Describe *Fig.* 27. How long are the intestines through which the chyle passes? What and where are the lacteals, and what do they do?

duct. This empties it into a vein near the heart, to be mixed with the other blood.

Fig. 28 (on the next page) is a picture of a small portion of the intestines, with the little vessels drawing off the chyle, and carrying it to the thoracic duct. It should be examined by aid of the key before proceeding.

It has been shown that the body is constantly decaying, and its dead particles are carried away by the veins, while the arteries bring a new supply of fresh blood from the heart to the capillaries. It is here shown how the capillaries are all depending on the stomach to furnish them with fresh chyle, which is to supply the place of the particles removed.

The stomach is so made that as soon as the capillaries need more chyle the sensation of *hunger* comes. This is the call of the stomach for more food, and if the needful supply is not obtained, a feeling of weakness and faintness pervades the whole body. Every part is calling for its needed food, and if it is withheld very long the suffering becomes intolerable. There is no suffering more distressing than this pining of every part of the body for the nourishing particles that the capillaries receive from the chyle, which the stomach alone can supply.

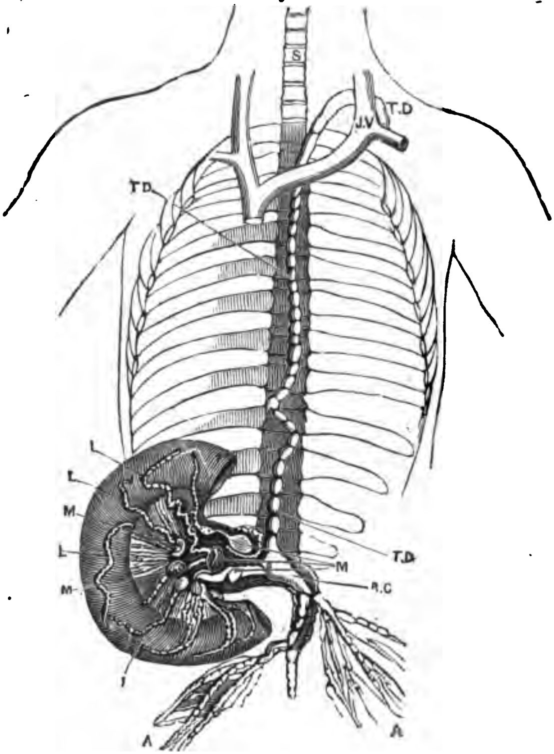
One of the most important portions of this subject is the manner in which the intestines in the thorax and abdomen are *packed* and retained firmly in their right position through all the labors, accidents, and injuries to which the body is exposed.

It has been shown that the thorax is filled with the heart and lungs. The foundation or elastic floor on which they rest is the diaphragm, whose muscles, by contracting and relaxing, lift the heart and lungs upward when we expire, while they sink when we inspire the air.

Directly under the diaphragm are the stomach, liver, spleen, and pancreas. Under these are the long intestines through which the chyle passes; and beneath the whole are the pelvic organs.

Questions.—Where does the thoracic duct empty? What does *Fig.* 28 represent? Explain it. On what do the capillaries depend for fresh chyle? When does hunger come? What follows if no supply is given? What organs fill the thorax? How are the other intestines arranged?

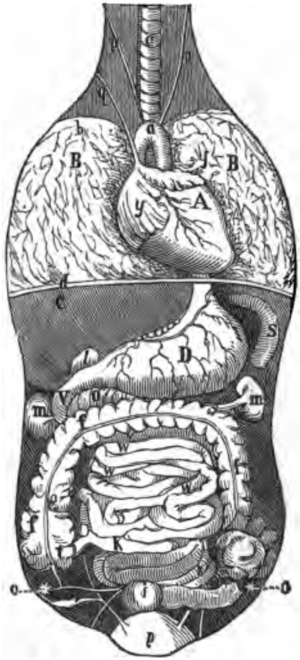
Fig. 28.



S, the windpipe.
T D, the thoracic duct.
J V, jugular vein into which the thoracic duct empties the chyle.
R C, a reservoir that receives the chyle from the intestines.
L M, a portion of the smaller intestines where the *lacteals* are seen drawing the chyle and carrying it to the reservoir, R C.
A A are lacteals coming from other parts of the intestines with chyle to be emptied into the reservoir, R C.

Fig. 29 and its key illustrate the position of these organs, and should be examined here.

Fig. 29.



Packing of the Intestines.

c, the windpipe.
a, the aorta.
A, the heart.
B B, the two lungs.
d, the diaphragm at its lowest position when the lungs are inflated.
c, the liver.
D, the stomach.
S, the spleen.
l, the gall-bladder.
o, the pancreas.
m m, the two kidneys.
w w, the smaller intestines through which the chyle first passes.
f f, the *colon*, or largest intestine, that terminates with the rectum, which is the final exit from the body.
o o, the two ovaries. } Pelvic
i, the uterus. } organs.
p, the bladder. }

In the front outer covering of the abdomen are very important muscles which press the intestines firmly *inward* and *upward*. These are called the *abdominal muscles*. Some run across the abdomen from side to side, and are fastened to the hips and ribs. Some run upward and downward,

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Questions.—Explain *Fig.* 29. Where are the abdominal muscles, and how are they fastened?

and are fastened above to the breast-bone, and below to the pelvic bone. Besides holding up the intestines in their place, these muscles have a most important office in aiding respiration. When the diaphragm contracts it is drawn downward, and thus presses the abdominal viscera downward. This makes room for air in the lungs, which rushes in and fills the lowest air-cells. Then the diaphragm relaxes, and the abdominal muscles contract, pressing the intestines upward, and thus pressing the air out of the lungs.

This alternate pressing of the diaphragm downward, and then of the abdominal muscles upward, is the process of *abdominal respiration*.

Some of the most dreadful evils that afflict both sexes result from a debility and relaxation of the abdominal muscles, which lessen their power to sustain the intestines that depend on them for support. In consequence of this there are displacements and disordered action that inflict the most terrible suffering, especially on the female sex. The evils from this cause will be explained hereafter.

Questions.—Explain the method of abdominal respiration. What consequences follow the debility of the abdominal muscles?

LESSON SEVENTH.

ORGANS OF THE MIND OR SPIRIT.

THE body has no power to move itself, but is a collection of instruments to be used by the mind in securing various kinds of knowledge and enjoyment. The organs through which the mind controls the body are the *brain* and *nerves*. The drawing on the next page (*Fig.* 30) represents them.

The brain lies in the skull, and is divided into the large or upper brain, and the small or lower brain. From the brain runs the spinal marrow through the spine or backbone. From each side of the spine the large nerves run out into innumerable smaller branches to every portion of the body. The drawing shows only some of the larger branches.

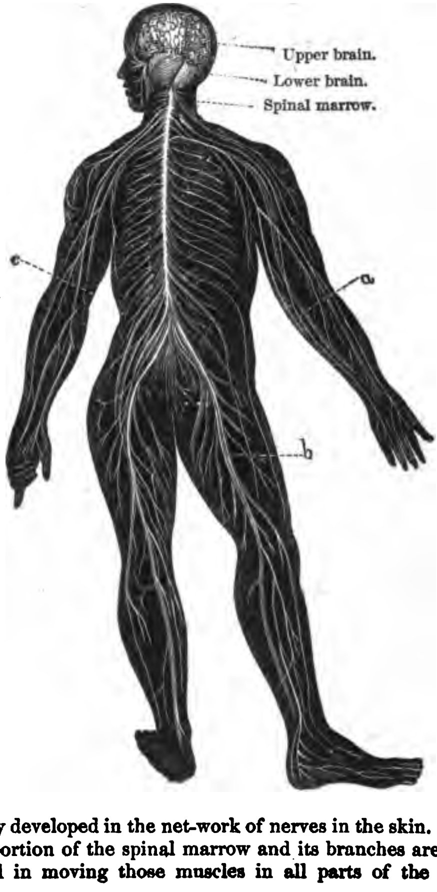
The brain and nerves consist of two kinds of nervous matter; the *gray*, which is supposed to be the portion that originates and controls a nervous fluid which imparts power of action; and the *white*, which seems to conduct this fluid to every part of the body.

The brain and nervous system are divided into distinct portions, each having different offices to perform, and each acting independently of the others. One portion of the brain is employed by the mind in thinking, in feeling pleasurable or painful emotions, and in choosing or willing. The nerves that run to the nose, ears, eyes, and tongue, are employed in seeing, hearing, smelling, and tasting.

The *front* portion of the spinal marrow and the nerves that run from it are employed in *sensation*, or the *sense of feeling*. These nerves extend over the whole body, but are

Questions.—What are the organs by which the mind controls the body? What does *Fig.* 30 represent? How is the brain divided? What runs from the brain, and what branches from it? Of what kinds of material does the brain consist, and what is done by each? How are the brain and nervous system divided? What is said of one portion of the brain? What of the nerves running to the eyes, ears, nose, and tongue? What of the *front* portion of the spinal marrow, and the nerves running from it? What are they named? Where do these nerves extend?

Fig. 30.



largely developed in the net-work of nerves in the skin. The *back* portion of the spinal marrow and its branches are employed in moving those muscles in all parts of the body

which are controlled by the *will* or *choice* of the mind. These are called the *nerves of motion.*

The nerves of sensation and nerves of motion, although they start from different portions of the spine, are united in the same *sheath,* or *cover,* in the muscles. Thus, every muscle is moved by nerves of motion, while alongside of this nerve, in the same sheath, is a nerve of sensation. All the nerves of motion and sensation are connected with that part of the brain which is used when we think, feel, and choose. By this arrangement the mind *knows* what is wanted in all parts of the body by means of the nerves of sensation, and then it *acts* by means of the nerves of motion.

For example, when we feel the cold air on the skin, the nerves of sensation report to the brain, and thus to the mind, that the body is growing cold. The mind thus knows that more clothing is needed, and *wills* to have the eyes look for it, and the hands and feet move to get it. This is done by the nerves of sight and of motion.

Next are the nerves of *involuntary motion,* which move all those parts of the head, face, and body, that are used in breathing, and in other operations connected with it. By these we continue to breathe when asleep, and whether we will to do so or not. There are also some of the nerves of voluntary motion that are mixed with these, which enable the mind to stop respiration, or to regulate it to a certain extent. But the mind has no power to stop it for any great length of time.

There is another large and important system of nerves called the *sympathetic* or *ganglionic* system. It consists of small masses of gray and white nervous matter, that seem to be small brains with nerves running from them. These are called *ganglia,* and are arranged each side of the spine, while small nerves from the spinal marrow run into them, thus uniting the sympathetic system with the nerves of the spine. These ganglia are also distributed around in vari-

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Questions.—What is said of the *back* portion of the spinal marrow and its branches? What are these nerves called? How are the nerves of motion and sensation united? By what does the mind know what is wanted? By what does it act? What example is given? What is done by the nerves of involuntary motion? Of what does the sympathetic or ganglionic system consist? What and where are the ganglia?

ous parts of the interior of the body, especially in the intestines, and all the different ganglia are connected with each other by nerves, thus making one system.

It is the ganglionic system that carries on the circulation of the blood, the action of the capillaries, lymphatics, arteries, and veins, together with the work of secretion, absorption, and most of the internal working of the body, which goes forward without any knowledge or control of the mind.

The following is a recapitulation of the preceding divisions of the nervous system:

First, the brain, by which we think, will, and feel pleasurable or painful emotions.

Second, the nerves of seeing, hearing, tasting, and smelling.

Third, the nerves of respiration, and the operations connected with it.

Fourth, the nerves of sensation and of motion.

Fifth, the ganglionic or sympathetic nerves.

There are a few nerves not included in this classification, but there is no need of describing them.

Every portion of the body has nerves of sensation coming from the spine, and also branches of the sympathetic or ganglionic system. The object of this is to form a sympathetic communication between the several parts of the body, and also to enable the mind to receive through the brain some general knowledge of the state of the whole system. It is owing to this, that when one portion of the body is affected, other portions sympathize. For example, if one part of the body is diseased, the stomach may so sympathize as to lose all appetite until the disease is removed.

All the operations of the nervous system are performed by the influence of the nervous fluid, which is generated in the gray portions of the brain and ganglia. Whenever a nerve is cut off from its connection with these nervous centres, its power is gone, and the part to which it ministered becomes lifeless and incapable of motion.

The brain and nerves can be overworked, and can also

Questions.—What is performed by the ganglionic system? What are the five divisions of the brain and nervous system as recapitulated? How is a sympathetic communication established between all parts of the body? By what fluid are all operations of the nervous system performed? Where is this fluid generated?

suffer for want of exercise, just as the muscles do. It is necessary for the perfect health of the brain and nerves that the several portions be exercised sufficiently, and that no part be exhausted by over-action. For example, the nerves of sensation may be very much exercised, and the nerves of motion have but little exercise. In this case, one will be weakened by excess of exercise, and the other by the want of it.

It is found by experience that the proper exercise of the nerves of motion tends to reduce any extreme susceptibility of the nerves of sensation. On the contrary, the neglect of such exercise leads to produce an excessive sensibility in the nerves of sensation.

Whenever that part of the brain which is employed in thinking, feeling, and willing, is greatly exercised by hard study, or by excessive care or emotion, the blood tends to the brain to supply it with increased nourishment, just as it flows to the muscles when they are exercised. Over-exercise of this portion of the brain causes engorgement of the blood-vessels. This is sometimes indicated by pain, or by a sense of fullness in the head; but oftener the result is a debilitating drain on the nervous system, which depends for its supply on the healthful state of the brain.

The brain has, as it were, a fountain of supply for the nervous fluid, which flows to all the nerves, and stimulates them to action. Some brains have a larger, and some a smaller fountain, so that a degree of mental activity that would entirely exhaust one, would make only a small and healthful drain upon another.

The excessive use of certain portions of the brain tends to withdraw the nervous energy from other portions, so that one part is debilitated by excess, and the other by neglect. For example, a person may so exhaust the brain power in the excessive use of the nerves of motion by hard work, as

Questions.—What is necessary for the perfect health of the brain and nervous system? What example is given? What is said of the nerves of motion and sensation? How is the brain affected by hard study, and excessive care or emotion? What are the indications of this? What is still oftener the result? What fountain has the brain? How are different brains in this respect? What effect has an excessive use of certain portions of the brain on other portions? What example is given?

to leave little for any other faculty. On the other hand, the nerves of feeling and thinking may be so used as to withdraw the nervous fluid from the nerves of motion, and thus debilitate the muscles.

Some animal propensities may be indulged to such excess as to produce a constant tendency of the blood to a certain portion of the brain, and to the organs connected with it, and thus cause a constant and excessive excitement, which finally becomes a disease. Sometimes a paralysis of this portion of the brain results from such an entire exhaustion of the nervous fountain and of the overworked nerves.

So, also, the thinking portion of the brain may be so overworked as to drain the nervous fluid from other portions that thus are debilited by the loss. And in this way, also, the overworked portion may be diseased or paralyzed by the excess.

The necessity for the *equal development* of all portions of the brain by an appropriate exercise of *all* the faculties of mind and body, and the influence of this upon happiness is the most important portion of this subject, and will be more directly exhibited in another lesson.

Questions.—What is said of some animal propensities? What is said of overworking the thinking portion of the brain? What is the most important part of this subject?

LESSON EIGHTH.

ORGANS THAT SECRETE, AND THAT PURIFY THE BODY.

We have seen that the lungs provide the oxygen for the capillaries, and also throw out the decayed particles of the body, as it day by day is decomposed and passes away. This labor of purifying is not done by the lungs alone; the kidneys, lower intestines, and skin, all aid. Experiments show that *five-eighths* of this waste matter passes off through the skin.

There is no part of the body that is so complicated with curious and wonderful contrivances as the skin; nor is there any that is so effective in causing either good or bad health. It consists of two layers: the outside skin, called the *cuticle*, which is very thin; and the under skin, which is much thicker, called the *true skin*.

The cuticle is at first a transparent fluid that exudes from the blood-vessels of the skin, is spread over the true skin, and becomes hardened into a thin layer. The cuticle is constantly forming and passing away. The external part, by evaporation, changes into thin, dry scales, which rub or drop away, while the blood constantly renews the under portion. The white, scurfy substance that passes off so distinctly in taking a warm bath, is the refuse portion of the cuticle. It is the under portion of the cuticle that gives color to all complexions, and which appears so diversely in the European and African races. The cuticle serves to protect the delicate texture of the true skin from injury.

Questions.—What is done by the lungs? What other organs aid in purifying the body? What organ does the most in this way, and in what proportion? What is said of the contrivance and action of the skin? Of what does it consist? How is the cuticle formed and removed? What part of the skin gives its color? What is the use of the cuticle?

The true skin consists chiefly of a net-work of blood-vessels, nerves, lymphatics, oil glands, and perspiration tubes; while on the head and several other parts of the body hair is also embedded and nourished in it. *Fig.* 31 is a drawing which represents some of the blood-vessels of the skin, and two hairs. It is very greatly magnified. In all parts of the skin are capillaries with small arteries that bring the blood to them, and small veins that carry it back to the heart. The blood thus winding through the capillaries of the skin, exceeds in quantity what is contained in all the other capillaries of the body.

Fig. 31.

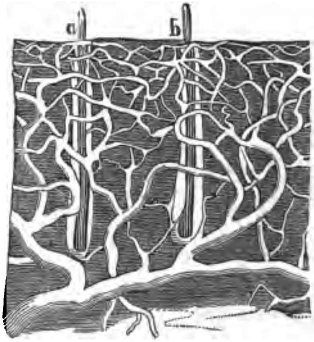
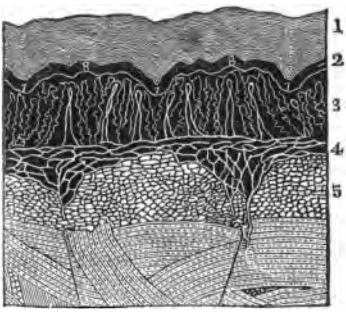


Fig. 32 is a drawing, greatly magnified, which shows the

Fig. 32.



1 is the cuticle.

2 is the colored part of it.

3 and 4 show the net-work of nerves in the true skin.

5 is the lower portion of the true skin, showing two points where two nerves from the spinal marrow enter and spread out into the net-work above.

Questions.—Of what does the true skin consist? What does *Fig.* 31 represent? What are in all parts of the skin? What proportion of the blood is in the capillaries of the skin? What does *Fig.* 32 illustrate? Explain it.

manner in which the nerves are spread through the true skin. The nerves and capillaries interlace; and so minute and close are they, that the point of a needle can not touch any point in the skin without touching both a nerve and a blood-vessel.

Fig. 33 is a drawing that represents a greatly magnified view of the *lymphatics* or *absorbents*. These are extremely minute vessels that interlace with the nerves and blood-vessels of the skin. What fills them is called *lymph*. Their office is to aid in collecting the useless, injurious, or decayed matter, and carry it to certain reservoirs, from which it passes into some of the large veins to be thrown out through the lungs, bowels, kidneys, or skin.

Fig. 33.



These *absorbent* or *lymphatic vessels* have mouths opening on the surface of the *true skin*. Though under the cuticle, they can absorb both liquids and solids that are placed in close contact with the skin. In proof of this, one of the main trunks of the lymphatics in the hand can be cut off from all communication with other portions, and tied up. Then if the hand is immersed in milk a given time, it will be found that the milk has been absorbed through the cuticle, and fills the lymphatics. In this way long-continued blisters on the skin will introduce the blistering matter into the blood through the absorbents, and then the kidneys will take it up from the blood passing through them to carry it out of the body, and thus become irritated and inflamed by it.

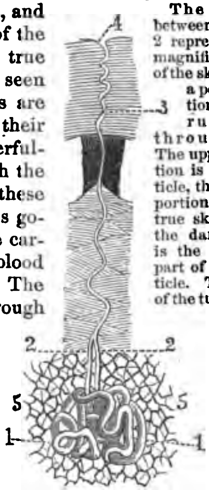
There are also oil tubes imbedded in the skin that draw

Questions.—How close and minute are the blood-vessels and nerves of the skin? What does *Fig.* 33 represent? What is the office of the lymphatics? Where do their mouths open? Does the covering of the cuticle prevent their absorbing? What is a proof of this? How do long-continued blisters operate? Where are the oil tubes, and what do they do?

off oil from the blood. This issues on the surface and spreads over the cuticle to keep it soft and moist.

But the most curious part of the skin is the innumerable minute perspiration tubes. *Fig.* 34 is a drawing of one very greatly magnified. These tubes open through the cuticle, and the openings are called *pores* of the skin. They descend into the true skin, and then form a coil, as seen in the drawing. These tubes are hollow, like a pipe-stem, and their inner surface consists of wonderfully-minute capillaries filled with the impure venous blood. And in these small tubes the same process is going on as takes place when the carbonic acid and water of the blood are exhaled from the lungs. The capillaries of these tubes through the whole skin of the body are thus constantly exhaling the noxious and decayed particles of the body, just as the lungs pour them out through the mouth and nose. It is calculated that about three or four pounds of waste matter pass off through the skin every twenty-four hours, and chiefly in the form of carbonic acid and water.

Fig. 34.



The space between 4 and 2 represents a magnified view of the skin with a perspiration tube running through it. The upper portion is the cuticle, the lower portion is the true skin, and the dark part is the colored part of the cuticle. The coil of the tube is at 1, imbedded in fat.

It has been shown that the perspiration tubes are coiled up into a ball at their base. The number and extent of these tubes are astonishing. In a square inch on the palm of the hand have been counted, through a microscope, thirty-five hundred of these tubes. Each one of them is about a quarter of an inch in length, including its coils. This makes

Questions.—What is the most curious part of the skin? What does *Fig.* 34 exhibit? Where do these tubes open? How are they placed in the skin? Of what does their inner surface consist? What process takes place in these tubes? How much in weight passes the skin every twenty-four hours, and in what form? How many of these tubes are there in a square inch of the skin?

the united lengths of these little tubes to be seventy-three feet to a square inch. Their united length over the whole body is thus calculated to be equal to *twenty-eight miles!* What a wonderful apparatus this! And what mischiefs must ensue when the *drainage* from the body of such an extent as this becomes obstructed!

MUCOUS MEMBRANE.

But the inside of the body also has a skin, as have all its organs. The interior of the head, the throat, the gullet, the lungs, the stomach, and all the intestines are lined with a skin. This is called the *mucous membrane*, because it is constantly secreting from the blood a slimy substance called *mucus*. When it accumulates in the lungs it is called *phlegm*. This inner skin also has nerves, blood-vessels, and lymphatics. The outer skin joins to the inner at the mouth, the nose, and other openings of the body, and there is a constant sympathy between the two skins, and thus between the inner organs and the surface of the body.

The skin has the office of regulating the heat of the body by a process that will be explained in another place.

SECRETING ORGANS.

Those vessels of the body which draw off certain portions of the blood and change it into a new form to be employed for service or to be thrown out of the body, are called *secreting organs*. The skin in this sense is a secreting organ, as its perspiration tubes secrete the bad portions of the blood and send them off.

Of the internal secreting organs the liver is the largest. Its office is to secrete from the blood any excess of carbon. For this purpose a set of veins carry the blood of all the lower intestines to the liver, where the excess of carbon is drawn off in the form of *bile*, and accumulated in a reservoir called the *gall-bladder*. From thence it passes into the

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Questions.—If all the tubes were united, how long would the whole be? What is said of the internal skin? Why is it called the mucous membrane? What is called *phlegm*? Where do the outer and inner skins join? What other office has the skin? What are the secreting organs? Why is the skin one of them? What is the largest internal secreting organ? What is its office? How is this done? What is said of the bile?

intestines, mixes with the food from the stomach, and aids in its digestion. The liver also has arterial blood sent to nourish it, and corresponding veins to return this blood to the heart. So there are two sets of blood-vessels for the liver, one to secrete the bile, and the other to nourish the organ itself.

The kidneys secrete from the arteries that pass through them all excess of water in the blood, and certain injurious substances. These are carried through small tubes to the bladder, and thence thrown out of the body.

The *pancreas* secretes from the arteries that pass through it the pancreatic juice, which unites with the bile from the liver in preparing the food for nourishing the body.

There are certain little glands near the eyes that secrete the tears, and others near the mouth that secrete the saliva or spittle.

These organs all have arteries sent to them to nourish them, and also veins to carry away the impure blood. At the same time they secrete from the blood the peculiar fluid which it is their office to supply.

All the food that passes through the lower intestines which is not drawn off by the lacteals or by some of these secreting organs passes from the body through a passage called the *rectum*.

Learned men have made very curious experiments to ascertain how much the several organs throw out of the body. It is found that the skin throws off five out of eight pounds of what passes from the body, or probably about three or four pounds a day. The lungs throw off one quarter as much as the skin, or about a pound a day. The remainder is carried off by the kidneys and lower intestines.

There is such a sympathy and connection between the secreting organs of the body, that when one of them is unable to work, the others perform the office of the feeble one. Thus, if the skin has its perspiration tubes closed up by a

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Questions.—What are the two sets of blood-vessels provided for the liver? What do the kidneys secrete? What does the pancreas? How are the tears and saliva secreted? What passes through the rectum? What proportion of the food and drink is thrown off by the skin, lungs, kidneys, and lower intestines? When one of the secreting organs is unable to do its work what follows?

chill, then all the poisonous matter that would have been thrown out through them must be emptied out either by the lungs, kidneys, or bowels.

When all these organs are strong and healthy, they can bear this increased labor without injury. But if the lungs are weak, the blood sent from the skin by the chill engorges the weak blood-vessels, and produces an inflammation of the lungs. Or it increases the discharge of a slimy mucous substance, that exudes from the skin of the lungs. This fills up the air-vessels, and would very soon end life, were it not for the spasms of the lungs, called *coughing*, which throw off this substance.

If, on the other hand, the bowels are weak, the chill on the skin, sending the blood into all the blood-vessels of the intestines, produces inflammation there, or else an excessive secretion of the mucous substance, which is called a *diarrhea.* Or, if the kidneys are weak, there is an increased secretion and discharge from them to an unhealthy and injurious extent.

This connection between the skin and internal organs is shown, not only by the effects of a chill on the skin, but by the sympathetic effect on itself when these internal organs suffer. For example, there are some kinds of food that will irritate and influence the stomach or the bowels, and this, by sympathy, will produce an immediate eruption on the skin.

Some persons, on eating strawberries, will immediately be affected with a nettle-rash. Others can not eat certain shell-fish without being affected in this way. Many humors on the face are caused by a diseased state of the internal organs with which the skin sympathizes.

This short account of the construction of the skin, and of its intimate connection with the internal organs, shows the philosophy of those modes of medical treatment that are addressed to this portion of the body.

It is on this powerful agency that the steam doctors rely,

Questions.—When the secreting organs are all strong, how is it? But if the lungs are weak, how does a chill of the skin operate? What is coughing? What is the effect of a chill when the bowels are weak? What is the effect of a chill when the kidneys are weak? How else is the sympathy between the outer skin and inner organs shown?

when, by moisture and heat, they stimulate all the innumerable perspiration tubes and lymphatics, to force out from the body a flood of unnaturally excited secretions; while it is "kill or cure," just as the chance may meet or oppose the demands of the case.

It is the skin also that is the chief basis of medical treatment in the Water Cure, whose slow processes are as much safer as they are slower.

At the same time it is the ill-treatment or neglect of the skin which, probably, is the cause of disease and decay to an incredible extent, as will be pointed out in the following pages.

Questions.—What is said of steam doctors and Water Cures? What is said of the ill-treatment of the skin?

LESSON NINTH.

ANIMAL HEAT.

It has been stated that the lungs and skin are the organs which provide and regulate the warmth of the body. The method by which this is done will now be explained.

There is an invisible agent called *caloric* or *heat*, which is the cause of warmth to the body, and to every thing else. *Cold* is simply the want of this heat.

Caloric tends to diffuse itself equally; that is, whenever bodies have different degrees of heat, the caloric is constantly passing from the warmer to the colder substances, till they all come to the same temperature.

Thus, when we go into air colder than our bodies, the caloric passes from us to the surrounding atmosphere. But when we are surrounded by air, or touch any substance that is warmer than our bodies, the caloric passes from it to us. Clothes prevent the heat from passing from our bodies to the air.

When water changes to ice, it gives out the caloric that kept it in a fluid state; and when it melts, and changes back to water, it takes in caloric from the air or from objects that are around. This is the reason why it is so chilly in a thaw. The caloric needed to melt the ice and snow is taken not only from the sun's rays, but from the air and other things around.

When water changes to vapor, it take in caloric; and when vapor changes back to water, it gives out the caloric that held it in the vapor form.

Questions.—What are the organs that provide and regulate the heat of the body? What is caloric? What is cold? What is the manner in which caloric tends to diffuse itself? Explain this, and give the examples. What is it that clothing does? When water changes to ice, what does it give out? When ice melts, from what does it obtain caloric? Why is it so chilly in a thaw? What is the process when water changes to vapor and vapor changes to water?

This, then, is the general rule in regard to changes made by caloric. When a more solid body changes to a thinner or less dense one, caloric is absorbed; but when it changes from a less dense to a more solid form, caloric is given out.

There are certain changes that are made in combining one body with another that produce heat. Thus when cold water is poured into *aqua fortis*, or *sulphuric acid*, heat is produced by the mixture.

When oxygen combines with combustible bodies, heat is produced, and sometimes light. Thus, when a candle burns, the light and heat are produced by the union of the oxygen of the air with the carbon of the tallow. So, when wood or coal are burned, the light and heat are made by the union of the oxygen of the air with the carbon of the wood and coal. When we blow a fire it burns faster, because more air is thus furnished, from which the oxygen is taken.

The *burning* of any substance is its union with oxygen, and those bodies that can be thus burned are called combustibles. Our bodies are composed chiefly of carbon, hydrogen, and nitrogen, which are combustibles, and also of oxygen, which unites with the other three. This union, which takes place in the capillaries, always produces heat.

The blood, before it passes through the lungs, receives a supply of chyle from the stomach, and in the lungs it takes its supply of oxygen. Then it passes to the capillaries, and there the oxygen unites with the decayed portions of the body, thus changing them to carbonic acid and water. This is a process of combustion the same as when oxygen unites with wood or coal. The oxygen of the new blood *burns* up a portion of the carbon and hydrogen in the capillaries, forming carbonic acid and water, and thus *heat is given out*.

Questions.—What is the general rule in regard to changes made by caloric? What other changes produce heat? What example is given? What is the effect of the combination of oxygen with combustible bodies? What examples are given? What is the burning of any substance? What are combustibles? Of what are our bodies composed? Which are the combustibles? What does their union with oxygen produce? Before the blood passes through the lungs, what does it receive from the stomach? What does it take in the lungs? When it passes to the capillaries, what takes place? What does the oxygen of the new blood burn? What is given out?

At the same time the fresh chyle is deposited in the place of the particles that are consumed.

The carbonic acid, formed by the combustion in the capillaries, and thrown out of the lungs and skin, is similar to the *smoke* of burning wood. Another product of this combustion, which is drawn off from the blood by the kidneys, is similar to *ashes*. Thus our bodies are kept warm by myriads of little fires in the innumerable capillaries.

In this process of warming the body, the stomach provides the fuel to burn, the lungs provide the oxygen to consume it, and the arteries carry the fuel and fire to the capillaries, where the combustion takes place. The veins then carry off the carbonic acid, which, like smoke from a chimney, pours out of our mouth and nose and through the skin, while the kidneys empty out the ashes.

By this process of combustion in the capillaries the body is always kept nearly at a uniform temperature, which is about 98° by the thermometer. This is as warm as is the air in some of the hottest summer weather.

The air is usually cooler than our bodies, and is thus drawing off the caloric constantly. Clothing is useful only as it prevents the passing off of heat faster than the capillaries can keep up the supply.

We will now attend to the method by which the body is kept sufficiently cool.

It has been shown that the skin is filled with little perspiration tubes which are constantly sending off carbonic acid and water from the blood. The carbonic acid passes into the air, but much of the water is retained on the skin. Here the warmth of the body changes it to a vapor. In this change it abstracts its caloric from the

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Questions.—What is deposited in the place of the particles thus burned? To what is this carbonic acid similar? What is similar to ashes? How are our bodies kept warm? In the process of warming the body what provides the fuel? What provides the oxygen? What carries the fuel and fire to the capillaries? Where does the combustion take place? What carries off the carbonic acid? What is it like, and through what does it pour out? What empty out the ashes of this combustion in the capillaries? What is the temperature of the body? How is the heat drawn off from our bodies, and what is the use of clothing? What are the perspiration tubes constantly sending off? What becomes of the water? How is it changed? What effect is produced by this change?

body, and thus cools it. Thus the more heat is made in the capillaries the more perspiration is exhaled; and this being turned to vapor cools the body as fast as the capillaries heat it.

It is owing to this cooling process, by the changing of perspiration to a vapor, that persons can stay in ovens hot enough to cook potatoes without being burned. The heat generates perspiration; this turns to vapor, and thus the body is cooled by the evaporation.

Thus the combustion in the capillaries keeps the body warmer than the surrounding air when it is cold, while, if the air becomes hotter than the body, the emission and evaporation of perspiration tends to cool it.

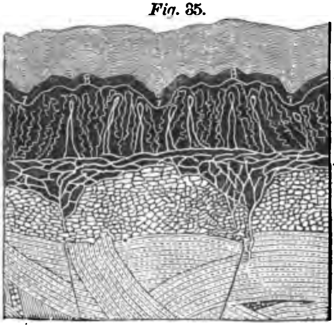
Questions.—How is the increase of heat in the capillaries regulated by the perspiration? Why can persons stay in hot ovens without being burned? What keeps the body warmer than the cold air around it? When the air is warmer than the body, what tends to cool it?

LESSON TENTH.

ORGANS OF SENSE.

THE nerves by which we feel, see, hear, taste, and smell, are called the *nerves of sense*, and the organs to which they run are called the *organs of sense*. They also are called the nerves of *sensation*, *feeling*, or *touch*, and are distributed all over the body, but chiefly abound in the skin. The drawing here presented is repeated to show again the manner in which these nerves, by their loops and net-work, are multiplied in extent through the skin.

Fig. 35.



The nerves of sensation, feeling, or touch, run from the front part of the spinal marrow. Those branches that go to the muscles are bound up in the same case with the nerves of motion, as has been explained. At 5, in *Fig.* 35, will be seen two branches of the nerves of sensation, coming from the spinal marrow, and ramifying through the under skin. The object of these nerves is to protect the body from danger, and to enable us to learn the qualities of objects.

As there are but few nerves of sensation in other parts of

Questions.—What are the nerves of sense? Where are the nerves of sensation, and by what other names are they called? Explain *Fig.* 35. What is said of these nerves? What is seen at 5, in *Fig.* 35? What is the object of these nerves?

the body compared with the skin, there is but little pain caused by cutting and bruises except on the skin.

The sensibility of the nerves of touch is increased or diminished by various causes. If a nervous branch is severed from its connection with the spine, all that part to which it sends nerves loses the sense of feeling. If the blood retreats from the skin by cold, the sense of feeling is diminished. Thus when the fingers are very cold, the sense of touch is gone. This sensibility is also diminished when the blood is impure from either bad food or bad air.

The sense of touch can be much cultivated and elevated, as is seen in the case of the blind, whose fingers can detect extremely minute qualities to which others are insensible. The cloth-dresser also, by touch, can detect qualities in cloth which others can not perceive. So can the miller detect the quality of flour by touch as others can not do.

The upper surface of the tongue is the organ of taste. The tongue is composed chiefly of muscular fibres that run in every direction, and thus give the power of innumerable motions. It is also provided largely with nerves of motion from the back of the spine. Then it has nerves of touch, or feeling, from the front of the spine. Then it has nerves of voluntary motion. Finally, it has the *nerves of taste.* These are arranged in two sets of *papillæ*, or little elevations. One set are very small and oval-shaped, over the whole surface of the tongue, and give its rough appearance. The other set are larger, and are small heads supported on stalks. The nerves of taste ramify through both these sets of papillæ. A strong acid applied with a fine hair pencil will cause these papillæ to be curiously elevated and lengthened.

When fluids are taken into the mouth, the papillæ dilate and erect themselves, while their nerves transmit to the brain the sensation of taste. When dry food is taken, the

Questions.—Why do internal cuts or bruises cause less pain than those on the skin? Mention some causes that diminish the sensibility of the nerves of touch. Can this sense be improved? What cases illustrate this? What is the organ of taste? Of what is the tongue chiefly composed? What nerves has the tongue from the back of the spine, and what from the front? What other nerves has it? How are the nerves of taste arranged? Describe them. How will an acid affect them? What is the process when fluids and when solids are taken into the mouth?

tongue carries it to the back of the mouth, to be moistened by the saliva, which flows from the salivary glands in the cheeks.

The savory taste is also carried by the saliva from the food to all the papillæ of the tongue, and thus to the brain. The principal object of taste is to guide in the selection of food.

The organ of smell is the mucous membrane that lines the nose, which has the nerves of smell ramified through it. The odoriferous particles in the air come in contact with these nerves, and thus the sensation of smell is transmitted to the brain. The chief object of this sense is also to aid man in the selection and care of food.

The eye is the organ of sight. This figure exhibits the two balls of the eyes, and 2 is the optic nerve running into each, by which the sensation of sight is conveyed to the brain, and thus to the mind. The eyeball is a most curious and wonderful instrument. It has three coverings, and the interior consists of three *humors*.

Fig. 36.

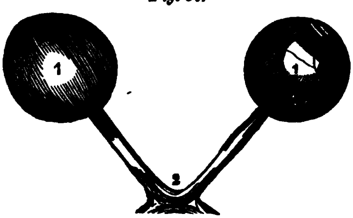


Fig. 37 (on the opposite page) represents one of these balls cut through the middle, as we look at the eye *sideways*.

The outer line is the outer covering marked 1. This, in the part seen, is the white of the eye. The dark line (marked 3) is the middle coat, which is black, and useful to absorb the light not needed. The inner line (marked 8) is the *retina*. It consists of a net-work made of branches

Questions.—How is the taste carried from solid food to the brain? What is the object of this sense? What is the organ of smell? How is the smell transmitted to the brain? What is the object of this sense? What is the organ of sight? How many coverings has the eyeball? How many humors has it? What is the outer line of *Fig*, 87? The middle line? The inner line?

Fig. 87.

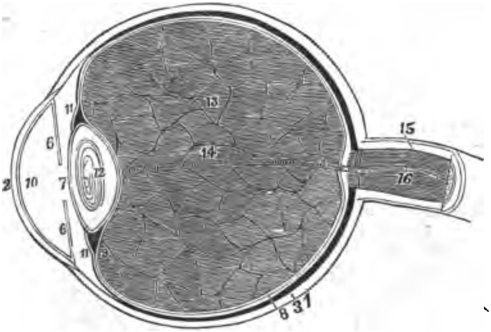


Fig. 87. A sideways view of the eyeball cut open, so as to view the interior. 1, the outer covering. 3, the dark middle covering. 8, the retina, or optic nerve. 2, the front of the eye. 7, the pupil, or small opening through which the light passes. 6, the iris, or colored border around the iris. 10 and 11, the watery humor filling that space. 12, the crystalline lens, or humor. 14, the vitreous humor. 15 and 16, the optic nerve, and a blood-vessel running with it and spreading over the retina.

of the optic nerve, and small veins and arteries. It is light falling on this inner lining of the eyeball that causes us to see; that is, it produces the sensation of sight on the brain, and thus on the mind.

The three humors are thus arranged: The *vitreous* (marked 13, 14) is the dark portion, and fills the largest portion of the eyeball. It looks like jelly. At 2 is the front part of the eye, and at 10 and 11 is the pure *aqueous* humor that looks like water. At 12 is the crystalline humor, which is white, hard, and shaped like a *lens*. At 7 is the pupil, or window of the eye, through which the light passes. 6, 6 represents the *iris*, or colored border around the pupil. 15 is the optic nerve, that spreads out into the retina. 16 shows the main artery, that sends its branches all over the retina and other parts of the eye.

Questions.—How is the retina formed? What causes us to see? How are the humors of the eye arranged? Where are the pupil and iris? Where are the optic nerve and the main artery of the eye?

Fig. 38 is a drawing that represents the muscles that move the eyeball. One of them runs through a loop that acts as a pulley.

Fig. 38.

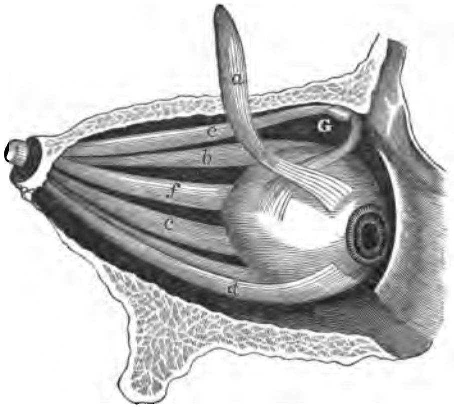


Fig. 38. A view of the eye and its muscles. *a*, *b*, *c*, *d*, *e*, five of these muscles. *f*, the optic nerve. G, the trochlea, or pulley over which one of the muscles passes. The bone is seen above and below the eye.

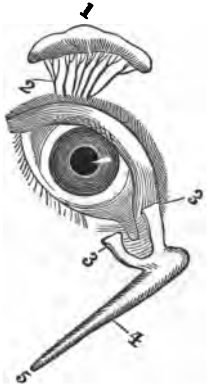
There are many other beautiful and curious contrivances about the eye that can not be described here.

Fig. 39 (on the following page) is a drawing that represents the contrivance for furnishing and carrying off the tears.

1 is the bag or gland which secretes tears from the blood. It is under the upper eyelid. 2 are the vessels conducting the tears to the eye. 3 are openings to receive and convey the tears to the sac; 4, that opens into the nose. The chief use of tears is to keep the eye moist, and carry off all light substances that get into it.

Question.—Describe the figure that exhibits the muscles of the eye. Describe the figure that illustrates the tear gland and sac.

Fig. 89.



1, tear gland.

2, conducting vessels to the eyelid.

3, tear duct to the sac of the nose.

4, sac of the nose.

The organ of hearing is the interior portion of the ear, over which is ramified the *auditory nerve.* The vibrations of the air strike on this nerve, and this causes the sensation of sound. The construction of the ear is very complicated, and not entirely understood.

Questions.—What is the organ of hearing? What causes sound?

PART SECOND.

LESSON ELEVENTH.

LAWS OF HEALTH AND HAPPINESS.

We have now completed a description of some of the most important organs of the human body. Surely no one can have contemplated them, even in this imperfect exhibition, without the frequent exclamation, "How fearfully and wonderfully made!"

The laws by which these curiously-arranged and nicely-adjusted instruments of happiness are to be made to fulfill their benevolent design, will now be considered.

The rules for the proper treatment of the various organs of the body are called *the laws of health and happiness*, because our Creator has connected the reward of enjoyment with obedience to these rules, and the penalty of suffering with disobedience to them.

God has created all his creatures with the desire and intention of making them happy. He has placed them in a world where every thing will promote their happiness, if used aright. He has given us reason and conscience to guide and regulate, so that when we find, by experience, that any thing tends to injure us, we know that we ought to avoid it, and we sin against both God and ourselves when we do not.

Any person who knowingly violates one of the laws of health, sins against God as really as when disobeying his commands recorded in the Bible.

Questions.—What are the rules for treating our bodily organs called, and why? For what has God created all his creatures? What is said of the world? What has God given to guide us? When we find, by experience, that any thing tends to injure us, what do we know? Do we commit sin when we indulge in what tends to injure us? What is said of a person who knowingly violates one of the laws of health?

We will now present the principal laws of health which should guide us in the care and treatment of our bodily organs.

LAWS OF HEALTH FOR THE BONES.

It has been shown that the size, strength, and health of the bones, as well as every other part of the body, depend on good blood and pure air. If the stomach is supplied with unhealthy food, or if it is loaded with more than the body requires, the blood becomes impure, and consequently the bones, in common with all other parts, suffer more or less from this cause. So also if the air we breathe is loaded with the effluvia from the lungs and skin, or is diluted by excess of heat, the bones suffer with the rest of the system for want of oxygen and of properly-prepared nutriment for the capillaries.

This shows the necessity of the first law of health for the bones: *Take care that the stomach has food of a proper kind and quality, and that the lungs are fully supplied with cool and pure air.*

We have learned that the bones also are in a measure dependent on exercise for size and strength. A child that grows up with but little exercise will have bones that are softer and weaker than those of one who is trained to vigorous exercise. This debility will more readily induce deformity or disease from causes that would not affect a vigorous system. From this results the second law of health for the bones:

Take care that the body has sufficient exercise in pure air every day.

We have seen how curiously the spine is arranged with its vertebræ one above another, with the cartilage discs between, and the spinal marrow passing through the whole. Now it is indispensable to the health and perfect growth of the spine that it should have a great variety of motions, and

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Questions.—What has been shown in regard to the bones? What is said of the influence of the stomach on the bones? What of the air? What is the first law of health for the bones? What effect has exercise on the bones? What is the second law of health for the bones? What is said of the arrangement of the spine? What is necessary to the health of the spine?

that it never should be *habitually* kept out of its natural position. For any long-protracted unnatural position will frequently result in the hardening of the cartilage discs in the portions where they are thus compressed, until permanent distortion is induced. This shows the reason for the third law of health for the bones:

Take care that the spine shall never habitually be kept out of its natural position either when awake or asleep.

It has been shown, when the body is compressed around the waist, that the left side being over the stomach yields more readily than the right side, which is more firmly sustained by the liver. In consequence of this, the ribs of the left side are forced by any compression more strongly toward one side of the spine than toward the other. This makes a slow and steady *sidewise* pressure until the spine yields and the discs gradually harden, and a permanent *curvature of the spine* is the result. This is seen by the elevation of one shoulder and the projection of one hip.

Another result of tight dressing is the entire change in the shape of the thorax. The bones of the body in early life are soft and yielding. Constant pressure on the short ribs brings them nearer together in front, while the internal organs are pressed downward, reduced in size, and oftentimes misplaced.

This deformity of the thorax in a mother is often transmitted to her offspring as a hereditary misfortune, to be perpetuated from generation to generation. This illustrates the importance of the fourth law of health to the bones:

Take care that the spine and thorax are not pressed into deformity by tight clothing around the waist.

LAWS OF HEALTH FOR THE MUSCLES.

It has been shown that the muscles, as well as every other part of the body, are nourished by the blood. Consequently

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Questions.—What is the third law of health for the bones? What is said of compressing the body? How is a curvature of the spine produced? What is the effect of tight dressing on the thorax? What is the consequence to the offspring when a mother is thus deformed? What is the fourth law of health for the bones? What is said of the blood, and its influence on the muscles?

the health and strength of the muscles depend on the quality of the blood. If the stomach is supplied with unhealthy food, or is loaded with more than is needed, unhealthy blood is the result. And if the lungs are supplied with impure air, the capillaries in all parts of the body lose their life-giving oxygen, which alone can purify the body from its unhealthful portions. Therefore the first law of health for the muscles is the same as for the bones:

Take care that the stomach has food of proper quality and quantity, and that the lungs are supplied with pure air.

We have seen that every movement of every muscle is attended with the decay of some of its particles, which must then be first changed by the oxygen brought by the arterial blood and then thrown out of the body through the lungs and skin. At the same time the fresh chyle takes the place of the particles thus removed. It has also been shown that whenever a muscle is exercised the arterial blood flows more abundantly into it in order to furnish an increased supply of oxygen and chyle. In this way the more the muscles are exercised the more strength and nourishment they receive from the blood, till they attain their full and perfect size. This is the reason for the second law of health: *Take care that all the muscles of the body are brought to their full size and strength by a proper amount of exercise for each.*

The exercise of the muscles may be so prolonged that the decay of their particles will exceed the supply of nutrition furnished by the blood. In this case the muscles will grow smaller and weaker from over-action. Some persons injure themselves as much by excess of exercise as others do by the want of it. This shows the reason for the third rule: *Take care that none of the muscles are weakened by excess of exercise.*

When the muscles have become small and feeble from want of proper exercise, a change in this respect must never be a sudden one. It should commence with but a small increase of exercise, and the daily additions should be very

Questions.—What of the stomach? What of the lungs? What is the first law of health for the muscles? What is said of the movement of the muscles? How is the arterial blood affected by exercise? What is the second law of health for the muscles? What is said of too much exercise? What is the third law of health for the muscles? What is said of sudden changes in regard to exercise?

moderate. If this is not attended to, the muscles will be injured rather than benefited by increase of exercise. This is the reason for the fourth rule: *When an inactive habit of the muscular system is to be changed, it should be by a slow and gradual process.*

As increase of exercise increases the flow of blood to the muscles, it is very important that it should be done in pure and cool air. For if there is an increased amount of blood, and this blood has not been properly supplied with oxygen in the lungs, the action in the capillaries of the muscles is imperfect. This shows the importance of the fifth rule: *Never increase the ordinary amount of exercise till cool and pure air is abundantly provided for the lungs.*

Light is very favorable to the perfect development of the human body. Vegetables that grow in the dark become pale and spindling; and so do children when they grow up in dark rooms and alleys of a city. This shows the reason for the sixth rule: *Let all vigorous exercise be taken by daylight, and not in the night.*

There is nothing more important to the health of certain muscles than a proper attitude in sitting and standing. In the natural position of the spine it is held in its upright form by its cartilage discs, so that there is no strain on any of the muscles of the trunk. But when we sit or stand crooked certain muscles are constantly in exercise to sustain the body in that position. After a habit of this kind is formed, the discs between the vertebræ gradually harden, and thus assist the muscles in their labor. But the result is, the spine becomes fixed in a deformed position, so that it can not be restored except by a long and laborious process.

But before this hardening process of the spine takes place the muscles that aid in supporting the spine are gradually reduced in strength, by constant labor in holding the body in an unnatural position. This shows the importance of the sev-

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Questions.—What is the fourth law of health for the muscles? Why is it important that exercise be taken in pure air? What is the fifth rule of health for the muscles? What is said of light, and how is it illustrated? What is the sixth rule? In its natural position, by what is the spine held upright? What is the effect when we sit or stand crooked? What effect has such a habit on the discs of the spine? Before the hardening process takes place, how are the muscles weakened?

enth rule: *Take care that the muscles of the trunk are not weakened by means of long-continued unnatural positions of the spine.*

Wherever any portion of the body is compressed by tight clothing the blood can not run freely into the muscles of that part. The consequence is, these muscles are reduced in size and strength. The muscles that sustain the spine should especially be protected from any such pressure.

This shows the folly of attempting to cure crookedness or round shoulders by corsets or bracers. Any thing that compresses the muscles weakens them. The grand remedy for any such deformities, is *a proper training of the muscles in pure air.* Tight articles of dress around the neck, or legs, or arms, interfere with the full health and strength of the muscles. This shows the reason of the eighth rule: *Take care that the muscles, especially those of the trunk, be not weakened by any kind of tight dress.*

In cases where the muscles are injured, or are so weak that little exercise can be taken, rubbing, beating, and pinching them, so as to increase the flow of blood into them, is very important. There is nothing that so comforts and strengthens the weak as having the muscles rubbed and otherwise exercised by intermitting pressure, especially when it can be done in pure air and after a bath.

In hot countries, where the inhabitants are too indolent to use their own muscles in the proper way, it is deemed a great luxury to take a bath and then have the muscles kneaded, pinched, and otherwise manipulated by bath attendants. This shows the reason for the ninth rule: *When a person is too weak to use the muscles, let another person increase the flow of blood into them by manipulations.*

There is nothing so indispensable to beauty of form as the *proper* exercise of *all* the muscles. It is rarely, if ever, the case in this nation that any care is taken in this respect. Children, in their sports, do not fail—especially if they have

Questions.—What is the seventh rule of health for the muscles? What is the effect of compression on the muscles? What muscles should be especially guarded from this? What is said of curing crookedness? What is the true remedy? What is the eighth rule? When the muscles are too weak to be used much, what can be done instead? What do people in hot countries do? What is the ninth rule? What is indispensable to beauty of form?

full run in the country—to accomplish this; but grown persons generally confine their exercise to a small portion of the body. In this way the perfect and rounded form of childhood is rarely preserved to mature life as it might be with proper care. This shows the need of the last rule: *Let special care be directed to the universal development of all the muscles during the period of childhood and youth, and take care that, all through life, the muscles of the whole body be duly exercised.*

Questions.—Do grown persons usually secure this? What is the last rule of health for the muscles?

LESSON TWELFTH.

LAWS OF HEALTH FOR THE LUNGS.

WE have seen that the lungs have two offices to perform: one is, to prepare the food sent from the stomach by adding the oxygen of the air to the chyle; the other is, the emptying out from the body the carbonic acid and water which are formed in the capillaries by the union of this oxygen with the decayed particles of the body. The combination of oxygen with carbon and hydrogen in the capillaries also produces the animal heat which keeps the body warmer than the air around us.

Every inspiration takes in about half a pint of fresh air, which is added to the air already in the lungs, this being about three pints. We inspire about twenty times every minute, taking about one hogshead of new air into the lungs every hour, and expire the same quantity of bad air. Thus every pair of lungs requires, every hour, a hogshead of pure air, and vitiates the same quantity.

Carbonic acid is a little heavier than common air; but when it is mixed and warmed, as it is in our lungs, it becomes lighter than the surrounding cooler atmospheres, and rises. Thus, in large assemblies in churches, the air at the upper part of the room is more impure than that below, which is supplied with air from without by the doors and windows. When cold and warm air are brought together, the warm air rises and the cold air presses downward. This is the cause of the motion in air which keeps the carbonic

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Questions.—What two offices do the lungs perform? What produces the animal heat of our bodies? How much air is taken at each inspiration? How many times a minute? How much new air do we inspire, and how much bad air do we expire each hour? How much pure air is needed every hour by every pair of lungs? What is said of the weight of carbonic acid? In what is the air most impure in churches and large assemblies? When cold and warm air come together, which rises? What keeps the carbonic acid from the lungs and skin of people from accumulating?

acid from accumulating in any one place where many people are breathing.

But the more the air is warmed, and the more houses are made close so that the outer air can not enter, the more the breathing of those in these houses increases the carbonic acid and uses up the oxygen.

As has been said, every pair of lungs vitiates a hogshead of air every hour; and therefore this quantity of pure air is needed each hour, by every individual, both by night and by day, in order to secure the most perfect health and enjoyment of life.

There is no way in which houses can be supplied with pure air but by some mode of ventilation which secures the continuous entrance and exit of as much pure air as is breathed by the inmates of these houses. Of course, the more persons are in one room or one house, the greater necessity of increased ventilation.

The introduction of warm air at the bottom of a room, and the construction of properly-placed ventilators for the escape of this air out of the room, is a sure mode of supplying a room with pure air. But unless great care is taken, the air thus heated will be too dry and too warm.

Open fire-places, that make a constant draught of the air of a room upward and outward, insure a constant supply of fresh air from the doors and windows.

But close stoves, with tight doors and windows, make it almost certain that the inmates of a room will constantly breathe impure air, which will act as a slow poison in undermining the constitution. And when the constitution is thus weakened, diseases of all sorts find ready entrance.

These remarks illustrate the first law of health for the lungs: *Every pair of lungs should have a supply of pure air at the rate of one hogshead for every hour.*

It has been shown that there are two processes for filling

Questions.—What is the effect of warming the air and making houses very tight and close? How much pure air should each person in a house have every hour? How is the only way to secure this? What is a sure mode of supplying a room with pure air? Why does this require care? What is the benefit of open fire-places and grates? What is the evil of close stoves and tight windows? How does impure air affect the constitution? What is the consequence of this? What is the first law of health for the lungs? What are the two processes of filling the lungs with air?

the lungs: one by the expanding outward and upward of the ribs; and the other by the action of the diaphragm and the muscles of the abdomen. Of course, any tight clothing around the ribs prevents their action in breathing; and tight dressing around the lower part of the body serves also to lessen the abdominal breathing. All such compressions make it certain that a portion of the air-cells of the lungs will never receive any air. In consequence of this the blood will not be properly supplied with oxygen, and the constitution is gradually weakened. This illustrates the importance of the second law of health: *The body should never be so constrained by the dress as to impede, in the least degree, the movement of the ribs or abdominal muscles in breathing.*

It has been shown how the body may be so altered in form as to become permanently crooked, and the shoulders rounded. Both these distortions diminish the space allowed to the lungs. A person with back bent must have the lungs, stomach, and abdomen pressed together in front so as to diminish the capacity for a full inflation; while round shoulders make a flat and narrow chest, and give little space for the lungs. This shows the importance of the third law of health for the lungs: *The habitual positions of the body in walking, sitting, and sleeping should be such as to give full expansion to the lungs in breathing.*

It is probable that there is no law of health so universally violated by all classes of persons as the one which demands that every pair of lungs should have fresh air at the rate of a hogshead an hour. If all the poisonous matter that pours from nose and mouth, and exhales from the skin, were *colored*, so as to be visible, and we should see a black or blue vapor accumulating around us as fast as the air of a room was vitiated, there would be an instant change in the feeling and conduct of mankind.

But as it is, the decayed particles of our bodies are float-

Questions.—What is the effect of tight clothing around the ribs? What around the lowest part of the body? What does all such compression do? What is the consequence? What is the second law of health for the lungs? What effect is produced when a person is crooked and round-shouldered? What is the effect of a back bent? What is the effect of round shoulders? What is the third law of health for the lungs? What law of health is the most violated? What would be the effect if the exhalations from the lungs and skin were colored?

ing about us, and accumulating around our sleeping pillows, every day and every night. At every inspiration we take in air thus adulterated. This is spread through the multitudinous air-cells, whose membranous extent equals the floor of a room twelve feet square, and then is expired with a still larger amount of unhealthful mixture.

And the richer our people grow the tighter they make their doors and windows, and the more they multiply stoves in sitting and sleeping rooms, and the less they exercise in pure air. While in some wretched country hovel the poor drink abundantly the life-inspiring and pure breath of heaven every hour of the day and night, the children of wealth sip it only for an hour or two, as they ride abroad in their luxurious equipages for "exercise and air."

Questions.—What is said of the decayed particles of our bodies? What is the extent of the membrane of the air-cells if all were united? What is the effect of growing richer? How are the poor better provided?

LESSON THIRTEENTH.

LAWS OF HEALTH FOR THE ORGANS OF DIGESTION AND NUTRITION.

We have seen that the nourishment for the body is prepared in the stomach and other intestines, and then carried through the lacteals and thoracic duct to a large vein which conducts it to the heart. Then it passes from the heart to the lungs, to obtain oxygen from the air, which completes its preparation.

The health of the body is greatly dependent on the *kind* of food taken, some being much more favorable to health than others; and we will first notice some facts that are useful to guide in the proper selection of nourishment.

ANIMAL AND VEGETABLE FOOD.

All kinds of food are composed chiefly of the four elements *oxygen*, *hydrogen*, *carbon*, and *nitrogen*. It is the *different proportions* in which these elements are combined that cause all the varieties in both animal and vegetable food. Wheat and potatoes, for example, have precisely the same ingredients as beef or any other meat, only in different proportions.

But the health of the body requires that, in certain circumstances, one kind of food, in which one of these elements abounds, shall be avoided, while in other cases it is necessary.

HEAT-FORMING AND FLESH-FORMING FOOD.

The two purposes of food are, first, to supply the nour-

Questions.—Where is the nourishment for the body prepared? Where and by what is it carried? For what does it pass from the heart to the lungs? On what is the health of the body greatly dependent? Of what four elements are all kinds of food composed? What is it that causes all the varieties of food? What is said of wheat, potatoes, beef, and other meat? What does the health of the body require? What are the two purposes of food?

ishment that takes the place of the old and decayed particles of the body; and, second, to furnish the fuel needed in the capillaries to warm the body. When the atmosphere is warm, less heat needs to be manufactured within; but in very cold air a large supply of carbon and oxygen must be carried to the capillaries, to supply the heat that is carried off by the surrounding atmosphere. With reference to this, food is divided into the two classes called *heat-forming* and *flesh-forming*. Those substances that contain the most *carbon* are those which best supply fuel for warming the body. Among these, sugar, molasses, the fat of animals, butter, and oils of all kinds, are the most common. On the other hand, the flesh of animals divested of the fat, and some of the vegetables, have least carbon.

From this it is manifest that it is needful to regulate the food with reference to the quantity of carbon required to warm the body. If an excess is taken into the system, all the organs are overworked in throwing it off.

Nitrogen is one of the ingredients of muscle or flesh, and therefore no animal can live a long time on food which is destitute of this element.

The flesh of animals furnishes this element in larger proportion than vegetable food. But nitrogen is a constituent in wheat, rye, oats, potatoes, and various vegetables, though not in so large a proportion as in animal food. Thus animal and vegetable food both supply all the elements needed for the perfect health of the body, and we need only proper knowledge and self-control to regulate the selection according as circumstances vary.

STIMULATING FOOD.

It is found that those articles are most *stimulating* which contain the most nitrogen. Such food makes the heart beat quicker, and all the organs of the body work faster than less

Questions.—What is the difference when the atmosphere is warm or cold? How is food divided with reference to this? What substances are best for warming the body? What are those that contain the most carbon? What have least carbon? What is the effect when too much carbon is taken in the food? What is said of nitrogen? What food furnishes the most nitrogen? What vegetable articles contain nitrogen? What is said of both animal and vegetable food? STIMULATING FOOD: What articles are most stimulating? How do they affect the system?

stimulating articles. The most stimulating of all food is the flesh of animals, which, as before stated, contains more nitrogen than any other article.

NOURISHING FOOD.

Articles that contain, in a given weight, the largest amount of the elements that both warm and nourish the body, are the most nourishing or nutritious. There are calculations made by chemists which show the amount of nourishment in each article of food. By these it appears that the common idea that animal food contains more nourishment than vegetable is incorrect.

Beans and peas are found to have more nutriment in a given weight than any other common food. And wheat and rye flour have more nourishment in a given weight than beef, or any kind of meat. It is the *stimulating* property of meat which has led to the impression that it is more nourishing than a vegetable diet.

The tables made by chemists, giving the amount of nutriment in each kind of food, show that while the flesh of animals (not the fat) in every hundred pounds has twenty-five of solid matter to seventy-five of water, bread has just the reverse; that is, seventy-five pounds of solid matter to twenty-five pounds of water.

All the experiments that have been made show also that vegetable food digests quicker than animal. Thus, bean soup, boiled rice, potatoes, stale bread, and several other articles, digest sooner than any kind of meat or any kind of meat broth.

The working people in almost every nation are obliged to live almost entirely on vegetable diet, because it is so much cheaper; for it takes fifteen times as much land to provide

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Questions.—Which is the most stimulating of all food? NOURISHING FOOD: What kind of articles are the most nourishing? Which is most nourishing—animal or vegetable food? What food has most nutriment? Which has most nutriment in a pound—wheat, bread, or beef? Why has meat been considered more nourishing than a vegetable diet? In the flesh of animals what proportion is solid matter? What is the proportion in bread? Which, then, has most nourishment in a pound? Which digests the quickest? What articles are mentioned as examples? What do working people live on in most nations, and why? How much more land is required to supply animal food than vegetable?

animal food as it does to supply a vegetable diet. The working people in Ireland live on potatoes. The peasantry of Lancashire and Cheshire, who are the handsomest race in England, live chiefly on potatoes and butter-milk. The bright and hardy Arabs live almost entirely on vegetable food. The brave and vigorous Spartans never ate meat. Most of the hardiest soldiers in Northern Europe seldom taste of meat. From the creation to this day more than two-thirds of mankind never have eaten animal food; and, except in America, it is rare that the strongest laborers eat any meat.

It is also a fact, that when, in past time, various great men wished to have their heads unusually clear for intellectual labor, they gave up animal food.

These things are stated to aid in removing the false notion that meat is *more nourishing* than other food, and to show that it is not necessary to the perfect development both of mind and body.

When men, from any cause, need to be not only nourished but *stimulated* by food, then animal food is the best. When they need to have their body well nourished, and yet not stimulated, then vegetable food is the best.

HIGHLY CONCENTRATED FOOD. INNUTRITIOUS FOOD.

There is a certain amount of *bulk* necessary to enable the stomach to perform the digestive process. For this reason, food that is so highly concentrated as to supply much nutrition in little space is not healthful. In order to render such articles digestible there must be a certain mixture of innutritious matter, that passes through the intestines without digestion or assimilation. The use of such innutritious food is to increase the bulk and to stimulate the organs. It is owing to this that bread of unbolted wheat is more easily digested than that made of fine wheat.

Questions.—What is said of the working people of Ireland? Of Lancashire and Cheshire? Of the Arabs? Of the Spartans? The hardiest soldiers of Northern Europe? What proportion of mankind never eat animal food? When great men wish to have their heads clear, what have they done? For what purpose are these things stated? When is animal food best? When is vegetable food best? Why is bulk necessary in food? What is the use of the innutritious part of our food? Why is unbolted wheat bread best?

DIGESTIBLE FOOD.

Food is digestible in proportion to the facility with which it is acted on by the gastric juice.

Some articles of food that contain abundant nourishment really yield but a small supply, because they do not easily digest; while others, that digest more readily, afford more nourishment, though their relative amount of nutriment is small. It is owing to this fact that those kinds of meat which digest readily are more nourishing, in certain states of the stomach, than much more nutritive articles, such as beans and peas, which are more difficult of digestion.

The above facts in regard to the nature of different kinds of food, are the foundation of the rules that are to guide in its selection.

RULES FOR SELECTING FOOD.

No person should be confined exclusively to one kind of food, unless it be one which combines all the elements required in nourishing all parts of the body. Experiments have been tried on dogs and cats, which show that an animal fed exclusively on fat, or sugar, or any article that is chiefly carbon, without any nitrogen, will become unhealthy, and live but a short time.

Milk and eggs have all the elements needed by the body in good proportions. So have wheat, rye, corn, potatoes, and many other vegetables, as well as some of the fruits. This, then, is the first rule for selecting food: *There should always be such variety in food as to furnish all the elements needed to nourish the body.*

In a warm climate the body does not need much heat generated within. And the air, being diluted with heat, contains less oxygen to burn the carbon in the capillaries. In reference to this, food that contains much carbon, such as oil, sugar, fat, and the like, should be avoided. And as

Questions.—In what proportion is food digestible? What is said of the influence of this easy digestibility in rendering some kinds of food more nourishing than others? What is said of one exclusive kind of food? What have experiments shown? What articles contain all the elements needed in the body? What is the first rule for selecting food? Why should food containing much carbon be avoided in a warm climate? What kinds of food are of this class?

heat is stimulating and exhausting, it is important that the food taken in warm weather should be cooling and unstimulating. For this reason, in a hot season or climate, animal food, which is the most stimulating of any, should be avoided, and the diet consist chiefly of bread, fruits, and vegetables, which are nourishing but not stimulating. As cold weather comes on, meat and oily substances may be eaten with more safety. Then, again, when spring returns, they should be relinquished, or reduced in quantity. This, then, is the second rule: *The selection of food should vary with temperature and seasons.*

The organs of young children are more sensitive and excitable than those of mature persons. For this reason, a nutritious diet of milk, bread, fruit, and vegetables is more suitable than stimulating animal food.

Regard should also be paid to *temperament*, both in children and in adults. Some persons are of a very excitable temperament, and such insure longer life and better health by a nourishing unstimulating diet. Others are cool, slow, and phlegmatic. Such can safely eat more stimulating food, and, in certain cases, it is more healthful than any other. A person of full habit and excitable temperament, in order to secure long life, should be confined almost exclusively to a diet of bread, fruit, and vegetables. This, then, is the third rule: *In selecting food regard should be had to age and temperament.*

The state of health, especially of the digestive organs, is to be regarded. When there is a tendency to constipation, highly concentrated food, such as candies, cakes, rice, and fine flour, should be avoided, and fruits, coarse bread, and vegetables be sought. When there is a tendency to diarrhea, then rice, fine flour, and other concentrated food should be sought, and fruits and vegetables avoided.

When the digestive organs are very sensitive and easily

Questions.—Why should animal food be avoided in warm weather? What is the second rule for selecting food? What is said of young children? What diet is best for them? What food should persons of excitable temperament seek? What should the phlegmatic seek? What is said of persons of full habit and excitable temperament? What is the third rule? When there is a tendency to constipation, what sort of food should be avoided, and what should be sought? What should be done when there is a tendency to diarrhea?

affected, it is important to adopt an unstimulating, yet nutritious diet as soon as warm weather approaches. Many young children would be saved from early death by attention to these rules.

Owing to habit or constitution some kinds of food are better adapted to the stomach of one person than to that of others. Experience is a better guide than theories. Such food as disturbs the stomach should be avoided, whatever it may be. And food that is difficult to digest should be wholly avoided, especially by those of delicate constitution or poor health. Nothing taxes all the organs of the body so much as food that will not digest properly, and yet must in some way be carried out of the body.

Universal experience has shown that unmixed and simple food digests more easily than rich and complicated articles. New bread is far more difficult of digestion than stale, because mastication changes it to a compact dough form, which does not readily unite with the gastric juice. It is quite the reverse with stale bread.

Oils and fats are much more difficult to digest when cooked than in their natural state. All articles made rich with butter, sugar, and spices, are difficult to digest. From these facts the fourth rule is derived: *In selecting food regard should be had to its relative digestibility and to the state of health, especially of the digestive organs.*

Questions.—What should be done when the digestive organs are very sensitive, and easily affected? What is said of food that disturbs the stomach, or is difficult to digest? What severely taxes all the organs of the body? What is said of simple food? Of new bread? Of stale bread? What articles are difficult to digest? What is the fourth rule for selecting food?

LESSON FOURTEENTH.

LAWS OF HEALTH FOR THE ORGANS OF DIGESTION AND NUTRITION.

PHYSICIANS and physiologists maintain that there is more sickness and death caused by excess in the *quantity* of food taken than by the violation of any other law of health. The reason of this is that men have so abused nature that *appetite* has ceased to be a guide to most persons as to the amount of food needed. Mankind collect a great variety of articles to tempt the palate, and then eat one thing after another till they feel full, and can eat no more. In this way the stomach receives far more than is required to nourish the body, and thus the nervous powers, together with the lungs, kidneys, bowels, skin, and lymphatics, are overtaxed to throw out of the system this excess. The energies of the body are slowly and gradually worn down by this excess of useless labor.

ON THE QUANTITY OF FOOD.

The following presents what should guide in reference to the *quantity* of food.

Persons who labor or exercise any way demand more food than those of sedentary habits. Whenever, therefore, any changes are made from active to sedentary habits, great care should be taken to diminish the quantity of food. This is especially important to young persons, who change from active home-duties to the inactive habits of students. Such ought to deny themselves, even when their appetite would lead to as large an allowance as common. Thus, in a short time, the appetite will accommodate to the real wants of the body.

Questions.—What is the cause of more sickness and death than any thing else? What is the reason? How do mankind tempt the palate to excess? What is the consequence? What is said of persons who labor? What is said of changes from active to sedentary habits? To whom is it especially important? What should such do?

The fact that the stomach of most persons in this nation of plenty has been so accustomed to more food than the system requires, is the reason why the appetite can not guide, and reason must take its place. Most persons eat more than they need, and the stomach accommodates till a habit is formed. And then there may be a feeling of *emptiness*, even when food is not needed.

The great preservative against excess in food is a *simple diet*. When the food is plain, and no tempting variety stimulates the palate, most persons will take only what the wants of the system require. But where there is a succession of articles, and those of a tempting nature, almost every person will eat more than is needful, and thus overtask the organs of the body in throwing off the excess.

There is a class of articles called *condiments*, that stimulate the appetite to an unnatural degree. Pepper, mustard, and spices, are those most commonly used. These articles have very little nourishment, are entirely needless, and always tend to create a false appetite. Besides this, they are inflammatory in their nature, and stimulating to the nervous system. The excessive use of salt, sugar, and molasses, is a method of stimulating the appetite by food which, in proper quantities, is healthful. Articles preserved in salt, sugar, or vinegar, are neither as easily digested, nor as healthful as those in the natural state. In reference to these facts, the following rule is very important: *The quantity of food should vary with the amount of exercise taken, and excess should be guarded against by a simple diet, and the avoidance of condiments.*

ON THE TIME AND MANNER OF TAKING FOOD.

There is no way in which children have their stomachs weakened so frequently as by irregular and frequent eating.

Questions.—What is the reason why the appetite can not guide? Why do some feel an *emptiness* when they do not need food? What is the great preventive against excess in food? What is the consequence of a variety of tempting articles? What are condiments? Mention some of them. What is the effect of eating them? What is said of salt, sugar, and molasses? What is said of articles preserved in them? What is the rule in regard to the quantity of food? What is the way in which children have their stomachs most frequently weakened?

None of the muscles of the body are taxed so severely as those of the stomach, and they need periods of rest. If, therefore, there is a constant entrance of food into the stomach, there is no time for rest, and a constant mixture of partly-digested and newly-arrived food interrupts the natural process of digestion. From two to three hours pass before the stomach ceases its muscular action, and then it needs two or three hours to rest. The meals, therefore, should be five or six hours apart for grown persons. Children, who are growing, and whose organs act faster, may eat a small luncheon between meals with advantage, if they feel hungry enough to eat bread alone, but not otherwise. The above shows the importance of the first rule: *Food should be taken at regular times, and at intervals of five or six hours. No food should be put into the stomach while the digestive process is incomplete.*

It has been shown that whenever any of the muscles are exercised, the blood flows more abundantly to them to supply the nourishment needed. Every movement of a muscle hastens the decay of its particles, and increases the demand for fresh nutriment. Therefore, when the stomach has a full meal to digest, a portion of the blood must leave other parts of the body for this service. But if during the time of digestion the muscles of the body are thrown into vigorous exercise, they draw off the blood, and thus the stomach is robbed of its proper proportion. So if the brain is set to work vigorously after a full meal, it draws off the blood which is needed by the stomach. This shows the need of the second rule: *Immediately after eating a full meal, vigorous exercise, either of body or mind, should be avoided.* Slight exercise, like riding, or agreeable mental activity, such as lively conversation, are favorable to good digestion.

When the body is exhausted by labor or vigorous exer-

Questions.—What is said of the muscles of the stomach? What is the effect of mixing new and partly digested food? How long do the muscles of the stomach work after taking food? How much rest do they need before eating again? How far apart should the meals be? What is said of children? What is the first rule in regard to the time and manner of taking food? What is said of the exercising of the muscles? What effect does it have on the blood when the stomach has a full meal to digest? What is the effect if the brain is set to work after a meal? What is the second rule?

cise, the stomach should not be taxed by the labor of digestion; for the nervous energies of the whole system have been employed in labor, and there is not a proper supply for the stomach till a period of rest intervenes. So after protracted mental labor, the whole body needs a period of repose before the stomach can properly be called to labor. This shows the reason for the third rule: *A half hour or an hour of rest should intervene after vigorous exercise, either of mind or body, before eating.*

During the period of sleep, the brain being inactive does not send out its supply of nervous fluid as in waking hours, and consequently all the functions of life go on slower, and the system has not its full power. This is shown by the respiration, which is slower during sleep than at other times. Of course the stomach shares in this temporary diminution of power. Though many persons have strong stomachs, so that they can digest food well even in the feebler hours of sleep, still it is imposing labor on the stomach at a wrong time. This is especially injurious to such as have a weak constitution or weak digestive powers. The fourth rule, then, is important: *Let two or three hours intervene between eating and sleeping.*

The position of the body has an important influence on the health of the stomach. A habit of standing and sitting crooked interferes with the functions of the stomach and bowels. These organs are thus crowded into an unnatural position, and have not room to perform their operations properly. Therefore the fifth rule is important: *Be careful not to interfere with the process of digestion by bad positions of the body.*

There is no portion of the body so intimately connected with the stomach and the liver as the *skin*. We have shown that the lining of the stomach and intestines is in fact only a continuation of the outer skin. The custom of physicians

Questions.—Why should not the stomach be taxed by digestion after severe labor of body or mind? What is the third rule in regard to the time and manner of taking food? How is the brain during sleep? What is the consequence? How is respiration during sleep? What is the fourth rule? What is said of the position of the body? How does crooked sitting and standing operate? What is the fifth rule? What organ is the most intimately connected with the stomach? What is the lining of the stomach and intestines?

to examine the tongue results from the fact of a sympathy which exists between the interior skin and the skin of the tongue, so that any diseased state within the body extends more or less to the mouth, especially to the tongue. This sympathy between the outer and inner skin makes it important to the stomach that we should, by ablution, and all other methods, keep the outer skin in perfect health. Therefore the sixth rule is important: *Attend to the health and purity of the skin as one mode of securing a healthy stomach.*

It has been shown that the process of respiration, when perfect and natural, involves the mutual action of the diaphragm and abdominal muscles, by which the lower intestines are constantly kept in gentle motion. This is a very important stimulus to the process of digestion. Of course any mode of dress that restrains the movement of the ribs and abdominal muscles interferes with this process. From this results the importance of the seventh rule: *Be careful not to interrupt the process of digestion by tight clothing around the middle or lower portions of the body.*

The health and well-being of all the organs of digestion and nutrition very much depend upon the *daily* evacuation of the lower intestines. *Regular habits* in this respect should be formed and carefully preserved. Such arrangements should be made in every family and in every school, that no person shall ever be obliged to delay when nature prompts to this necessary duty. Such delays always tend to produce constipation. Every parent and every teacher should carefully guard the young from such violations of the laws of health. There is no rule of health more important than the eighth: *Take all proper methods to prevent constipation.*

The experiments in the Water Cure establishments prove that some notions in regard to drink have been mistaken ones. It has been shown that veins of the stomach draw off the superfluous liquids before digestion commences. A

Questions.—Why do physicians examine the tongue? What is the sixth rule in regard to the time and manner of taking food? How do the motion of the diaphragm and abdominal muscles aid digestion? How would tight clothing operate? What is the seventh rule? What is the eighth law of health for the stomach and bowels? When water is in the stomach, what draws it off into the blood?

pint of water will be thus taken off in five or six minutes, as has been witnessed in experiments made on St. Martin, a man who had a large opening made into his stomach, which healed up in such a way that all the processes within could be seen.

When liquid food—such as broths, soups, or juicy fruits—are taken, the first process is the absorption of the excess of liquid. This shows that no special harm is done by taking drink with our meals. It is as well to eat solid food and drink water at the same time, as to take bread and milk, or eat soup and broth. In either case, the stomach performs the same duty, and removes the excess of liquid. Very cold drinks interrupt the digestive process, and should not be taken while eating.

The notion, too, that there is any danger from drinking freely of *cold* water at times when the stomach is empty, is also exploded by multitudes of experiments. Nothing is more serviceable to digestion, or better promotes the healthful action of all the functions of the body, than drinking two or three tumblers of cold water before a meal, especially before breakfast. There is no danger of "thinning the blood" so long as the kidneys perform their office of removing from the body any excess of liquids. Pure cold water is a tonic to the capillaries, and instead of thinning, tends to purify the blood. It is also a remedy for constipation and inaction of the liver.

The rules, therefore, that have been given by some writers and physicians, not to drink freely of cold water, are not founded on a correct philosophy or a sufficiently extended observation.

There is no way in which the stomach and whole body has been so much abused as by the use of stimulating drinks. It is found by the experience of ages, that alcohol and opium, tea and coffee, simply stimulate the brain and nervous system, and furnish little or no nourishment. This stimulus is always followed by a reaction of debility, which is proportioned to the degree of previous stimulation.

Questions.—How fast can water in the stomach be taken off? What is said of liquid food? What does this show? What is said of the benefit of drinking cold water? At what times should it be done? Which are the stimulating drinks? How do they operate?

The body always accommodates, more or less, to any kind of abuse, so that such stimulants may be taken often and long without any immediate or perceptible injury. But this no more justifies the use of these articles than it does the taking of arsenic or any other poison to which the body may in some degree become habituated. In some countries of Europe the people use small quantities of arsenic, because the first effect is both to stimulate and to increase flesh and beauty of countenance. And when the habit and a love of the excitement are thus formed, the practice is continued, though emaciation and death are the final results. Animals, having no reason to guide them, are formed so that they usually have an instinct to warn them from those kinds of food that would harm them. But man, having reason bestowed for his guidance, is expected to form habits of virtue and self-control, so that when experience shows any practice to be pernicious it will be avoided.

There is nothing so abundantly proved as that narcotic and alcoholic drinks are never needed except as medicinal agents, and that their habitual use always tends to injury and excess. Men are debilitated by alcoholic drinks and tobacco. Women are almost as much injured in their health and comfort by the use of tea and coffee. Multitudes of wives and mothers become feeble, irritable, and miserable from the daily exhaustion caused by these narcotic stimulants. They feel the loss of their tea or coffee almost as much as the inebriate misses his daily libations. And yet they are so ignorant of physiology as often to imagine that the little strength they have is the gift of the baneful cups which yield only poison. They drink and feel better because a new stimulus is applied to the brain and nerves, to be followed by a new, secret, but certain drain on their nervous fountain. This ninth law of health, then, is imperious: *Never use stimulating drinks, except for medicinal purposes.*

Questions.—What is said of the mode in which the body accommodates to abuses? What is said of the use of arsenic? What is the difference between animals and man? What is proved in regard to narcotic and alcoholic drinks? By which are men, and by which are women most injured? What is said of wives and mothers? When they use these drinks, why do they seem to be better? What follows? What is the ninth law of health for the stomach?

LESSON FIFTEENTH.

LAWS OF HEALTH FOR THE SKIN AND SECRETING ORGANS.

We have attended to the curious and wonderful construction of the skin, and the various important functions it fulfills in protecting the body, in acting as the organ of touch, in purifying the blood, and in warming or cooling the body as its varying temperature may require.

Inasmuch as so large an amount of unhealthful matter is to be sent out of the system through the skin, we can perceive the importance of keeping the pores, which are its outlets, free from all accumulations. The pressure of the clothing tends to confine these excretions to the surface, while heat and moisture stimulate the lymphatics to absorb any thing on the skin. Thus a double evil may ensue, in preventing the outflow of unhealthful matter, and the reabsorbing of what is already sent out. This shows the importance of the first rule of health for the skin. *Take care that every portion of the skin is purified by washing the whole body at least once a day.*

It has been stated that there is more blood in the capillaries of the skin than in those of all the rest of the body. This being the case, there is nothing more necessary to the equal and proper circulation of the blood, than that the capillaries of the skin be at all times well filled. Nothing is a surer sign of health than a skin whose capillaries are in full circulation. And whenever any internal trouble exists, the main reliance for relief should be to draw the blood to the skin, and thus reduce the internal inflammation. All

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Questions.—What are the several functions of the skin? Which are the pores of the skin? Why should they be kept free from accumulations? What effect has the pressure of clothing? What is the effect of heat and moisture? What double evil may ensue? What is the first rule of health for the skin? What proportion of blood has the capillaries of the skin? What, then, is necessary to the equal and proper circulation of the blood? What is a sign of health? What should be the main reliance when there is any internal trouble?

inflammations are the effect of the engorgement of the capillaries with an excess of blood.

This shows the philosophy of the steam-doctor's cure, in certain cases, and of the use of blisters. The steaming of the whole body brings the blood into the skin, and thus inflamed internal organs are relieved, and much bad matter thrown off through the pores. But this process tends to debilitate the skin. Blisters are put on the skin near the place where some internal inflammation exists, and by exciting another point excessively, draw the blood from the inflamed part. Thus, inflammation on the lungs can sometimes be relieved by a blister on the chest. But both these remedies involve evils, and are inferior to certain *safe* processes of the Water Cure that will hereafter be explained.

This shows the reason for the second law of health: *Whenever the body has been in any way chilled, and internal disorder results, relief should be sought by drawing the blood into the capillaries of the skin.*

It has been found that both *light* and *air* are healthful tonics to the skin. A *tonic* is any thing that imparts strength. A child that grows up in a dark cellar, or any dark room, will always have a pale and unhealthy countenance. The effect of air and light in strengthening the skin is shown by the face and exposed parts of the neck, which become so strong to bear changes of temperature as scarcely to feel them. This shows another advantage of universal washing of the person, as thus the skin obtains an *air bath*, and the genial influence of *light*. There is much advantage, also, in prolonging the exposure of the skin to the air, so long as it can be done and yet retain a warm and healthful glow. But as soon as a chilly feeling commences, the clothing should be resumed. The object of clothing is to prevent the animal heat generated in the capillaries from passing to the surrounding air. If there is too little covering, then the

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Questions.—What are all inflammations? What is the effect of steaming the skin? What is the tendency of this process? How do blisters operate? What is the second law of health for the skin? What is said of air and light? What is a tonic? What is the effect on children that grow up in dark rooms? What show the effect of air and light in strengthening the skin? What is said of bathing, and of long exposure of the skin to air and light? What is the object of clothing?

skin becomes chilled, and its pores closed, and we *take a cold.* Sometimes, when one part of the body is chilled, the cold settles in some of the muscles whose capillaries are engorged by the blood retreating from the skin. This is called a *rheumatism.* Sometimes the capillaries of the nerve-cases become engorged by a chill, and this is one species of *neuralgia.* Sometimes the face has been chilled, and then the capillaries of the teeth and jaws become engorged, and toothache ensues. These particulars show the reasons for the third rule: *Take care to save all parts of the body from chills that will close the pores.*

It has been found by experience, that when cold water is applied to the skin, there is, in good health, an immediate contraction of the capillaries, which sends the blood for an instant inward; but immediately there is a reaction of the system, which returns the blood to the skin in greater quantities. This has the same benefit on the capillaries of the skin which exercise has on the muscles. It increases their capacity of holding blood, and their action in sending off bad material, and replacing it with new; and it is thus the skin is strengthened to bear changes of temperature without feeling uncomfortable or being injured.

On the contrary, it has been found by experience, that the application of heat to the skin, though it draws the blood into the capillaries, does it by a process that debilitates instead of strengthening. Thus, a person in good health may take a cold bath every day, and gain vigor. But if he should take a hot bath as often and as long, it would debilitate. It has been found, however, that if a hot bath is followed by a cold one, this debilitating influence on the skin is lessened. As a general rule, then, cold is a tonic to the skin, and heat debilitates it. From this follows the third rule of health for the skin: *Take care that no part of the body be kept so warm by clothing as to debilitate it by excess of heat.*

Questions.—What is the effect of too little clothing? What is rheumatism? What is one species of neuralgia? How is toothache sometimes caused? What is the third rule of health for the skin? What is the first effect of cold water on the skin? What is the next effect? How does this benefit the capillaries? How is the skin affected by it? What is the effect of the application of heat to the skin? What prevents the evil of a warm bath? What is a general rule about cold and heat? What is the third rule of health for the skin?

It has been found, also, that the power of the body to bear cold depends much upon habit. When the skin has been kept very warm with too much clothing, it becomes very sensitive to cold. On the contrary, cold bathing, and light clothing, and frequent exposures to the cold air, so strengthen the whole body, and especially the skin, that very much less clothing is needed than where the habits are the reverse. So persons who take a great deal of exercise outdoors, generate so much animal heat, and have their skin so strengthened by cold air, that they require much less clothing than those who go out but little, exercise but little, and keep their skins overheated by fires and clothing. The fourth rule, then, is important: *Take care to keep the body warm by exercise, cool air, and bathing, instead of relying on clothing and fires, which tend to debilitate the skin.*

There is always danger of *excess* in applying the foregoing rules. Some constitutions are so weak that they have not nervous power enough to bear much exercise, or to resist the cold. Many such have been seriously injured by cold bathing, by exposures to cold weather, by deficient clothing, and by over exertions. There is almost an unerring index to guide such in these attempts to secure good habits in the above particulars. Whenever the skin is too delicate, or the body too feeble to bear cold bathing, there is a sensation of discomfort, a chilliness, or a consequent debility, which should immediately be heeded. And so in regard to clothing and exposure to the air. Whatever makes a person chilly and uncomfortable should be avoided. There should always be a slow and cautious method pursued in all attempts to change the habits, especially in the management of the skin.

A delicate person, unaccustomed to expose the skin to cold air and cold water, should begin to bathe in a warm room, and use tepid water at first, and follow bathing with

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Questions.—Upon what does the power to bear cold depend? What is the effect of too much clothing? What is the effect of cold bathing and cold air? What is the effect on the skin of air and exercise? Of what is there danger in applying these rules? What is said of some constitutions? What index is there to guide in regard to bathing, clothing, and exposure to the air? How should a delicate person proceed in cold bathing?

a good deal of friction. Then each day the water should very slowly and gradually be reduced in temperature, and the air of the room in warmth. The fifth rule, therefore, is very important: *Never use water so cold or clothing so thin as to cause a sense of chilliness and discomfort. Change the habits in these respects very slowly, and always stop when discomfort is induced.*

In regard to bathing, it must be remembered that, while warm bathing tends to debilitate, cold bathing draws off the animal heat, and may be carried to such an extent as to undermine the constitution. Many children have been seriously injured by bathing too often, or staying too long in cold water. The animal heat is thus drawn off faster than the powers of the body can supply it, and the process becomes debilitating. So, while some children have their skin weakened by wearing too much clothing, both while sleeping and waking, others are equally injured by being forced to go about chilly from want of enough covering. In general, young children need more clothing than adults. This is a safe rule for children: *Keep as little clothing on children as is consistent with their comfort, but add more when they complain of chilliness.*

Age and disease both reduce the powers of the system to generate heat and to react when cold is applied. For this reason *the invalid and the aged should wear more clothing than the young and vigorous, and be more cautious in using cold baths.*

Currents of air on certain parts of the body are more injurious than a general cooling of the whole body. The reason is, that heat is withdrawn much faster by a current of air than by a still atmosphere. And when this current is confined to a small portion of the body, it causes the blood to retreat from that to the inner organs, and thus renders the circulation unequal, and the system less prepared to act vigorously against the evil. This rule, therefore, is import-

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Questions.—What is the fifth rule of health for the skin? To what does warm bathing tend? What does cold bathing do? How have children been injured? Why? How does too much or too little clothing injure some children? What is the rule for clothing children? What for invalids and the aged? What is said of currents of air on certain parts of the body?

ant: *Currents of air on the head or neck, or any particular part of the body, should be avoided. Any part of the body that has been habitually covered, should not be exposed without a gradual process to inure it to the change. Any change in amount of clothing worn should be made in the morning, because the body is then most vigorous.*

It has become a very prevalent notion that it is dangerous to bathe or to go into the cold air when the skin is very warm. This has arisen from the fact that in a perspiration, the clothing being wet, cold air carries off the heat much faster than when the clothing is dry. At the same time, the sweating process sometimes proceeds so far as to debilitate the skin.

But the experience of Water Cures has proved that the best time to bathe is when the skin is warm and flushed with exercise.

It is when the capillaries are filled with blood that the nerves and blood-vessels are at the highest point of vigor. On the contrary, when the skin is cool there is less blood and less vigor to resist cold.

This rule, then, is important: *When the body is to be suddenly exposed to cold air or cold water, the capillaries of the skin should be filled with blood by exercise or friction.*

As the impurities of the body sent out through the skin collect in the clothing and bedding, and as the absorbents of the skin take back impurities that are pressed on to it, it is very important that the clothing should be changed often. And as fresh air has a direct effect in carrying off these impurities, it is important that bedding and clothing should be well aired. This, rule, then, is necessary: *Take care to air the bedding and night clothes, and to change frequently the garments worn next the skin.*

Inasmuch as there is more blood in the capillaries of the skin than in all the other capillaries of the whole body, we can see how important it is to the health of this organ that the stomach should be supplied with proper food and

Questions.—What is the rule as regards currents of air? What is said of bathing when the skin is very warm? When is the best time to bathe, and why? What is the rule in regard to this? Why is it important that the clothing should often be changed? Why should bedding and clothing be aired? What is the rule in reference to this matter?

in proper quantities. It is probable that most evils that are developed in cutaneous eruptions, result from excess in eating, or from a wrong selection of food. This rule, then, is important: *Take care that the health of the skin be secured by moderate supplies of properly selected food.*

It has been shown that the skin is intimately connected with the lungs, liver, kidneys, and bowels, and that any abuse of any one of these may affect the health of any of the others. Whenever, therefore, any internal organ suffers, care should immediately be taken that all the functions of the skin are in full and perfect operation. And special caution should be directed to prevent any increase of disease by any chill of the skin.

In climates that are deemed unhealthy, or where unhealthy miasmas abound, special care should be taken that the skin be kept clean, and the capillaries well-filled by exercise, food, and warmth. In moving among contagious disorders, the keeping of the skin clean and warm, and properly nourished by simple and wholesome food, is the surest preventive from disease. This rule, then, is important: *In times of sickness or of exposure to epidemic or contagious disease, take great care to keep the skin clean, and warm, and well-nourished.*

We have seen that the secreting tubes of the skin that draw off the unhealthful portions of the blood amount, if all united, to *twenty-eight miles* in length. All this apparatus is dependent on the purity of the air to secure the requisite amount of oxygen for the performance of its functions. There is no portion of the body that suffers more directly and severely from an impure atmosphere than the skin. This rule, then, is imperative: *Guard the health of the skin at all times by surrounding it with pure air.*

Questions.—Why is it that the food especially affects the skin? What is the rule in reference to this? With what is the skin intimately connected? When any internal organ suffers, what should be done? What special caution should be taken? What should be done when the climate is unhealthy, and when contagious disorders prevail? What is the rule on this subject? What is the united length of the perspiration tubes of the skin? What does all this depend on? What is the rule on this subject?

LESSON SIXTEENTH.

LAWS OF HEALTH FOR THE BRAIN AND NERVES.

We have seen that the brain and nerves are the organs by which the mind controls the other parts of the body. We have also seen that they are divided into distinct portions, each having different offices to perform, and that a nervous fluid generated in the brain is the medium of influence between the mind, and brain, and nerves.

We have seen that the fountain that supplies this fluid may be so overdrawn by excesses as to be exhausted, and also that certain portions of the brain and nervous system may be overworked, and thus debilitated, while other portions may become equally debilitated by inaction.

Before proceeding to set forth the laws of health for the brain and nerves, some preliminary remarks are needful in reference to the nature of true happiness, and the mode of attaining it.

We will first assume, what probably few will dispute, that in the formation of our minds and bodies, our benevolent and wise Creator aimed to secure to his creatures the best happiness by the best methods, and that he has placed us in a system wisely adapted to secure this end. Being thus endowed and thus placed, we are to learn, by our own experience and that of others, how we are to use our various powers and susceptibilities so as to secure the happiness which we are formed to enjoy.

By this experience we have learned that there are two methods which may be adopted. One is to seek and enjoy

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Questions.—What are the organs by which the mind controls the body? How are the brain and nerves divided, and for what end? What is the medium of influence between the mind and the brain and nerves? What is said of overdrawing the nervous fountain, and of overworking the brain and nerves? What was the design of our Creator in forming our minds and bodies? How has he placed us? How are we to learn to secure the happiness for which we are formed?

temperately a great variety of intellectual, social, and moral pleasures, giving to each its due proportion, and allowing no injurious excess in any. Where this course is pursued the happiness of life is made up of multitudes of successive enjoyments, no one of which is very exciting or ecstatic, but the united sum producing a calm, steady, satisfying happiness.

By the other method all the feelings and energies are directed to a few objects, which, if secured, are enjoyed to excess, while other resources remain closed, and the mind is unharmoniously developed.

Experience also teaches that there are some kinds of happiness much more elevating and satisfying than others. Thus intellectual pleasures exceed those of a merely physical nature, social pleasures are superior to selfish, while moral and religious enjoyments are the most elevating and perfect of them all.

True and abiding happiness, then, is to be found in the proper and equal development and exercise of all the faculties of body and mind, and in the appropriate selection and proportion of the objects of enjoyment.

We will now consider the laws of health for the brain and nerves.

One of the most important of these laws is what has been repeated in reference to every other portion of the body. The quality of the blood that nourishes the brain depends on the right selection and quality of food, and on the full supply of oxygen which pure air alone can afford. When the blood is surcharged with heavy and gross material from excess in diet, it clogs the operations and impedes the health of the brain and nervous system. And when the air inspired by the lungs is impure, the brain loses in the same proportion its healthful stimulus. The brain never acts so freely and clearly as in a perfectly pure atmosphere, while

Questions.—What is the first method by which happiness may be sought? What is the result of this course? What is the other method? What does experience teach as to the different modes of happiness? What is the order in which they are placed? How is true and abiding happiness to be found? On what does the quality of blood that nourishes the brain depend? When the blood is loaded by excess, how does it affect the brain and nerves? What is the effect of bad air on them? When does the brain act most freely?

dullness and debility are the certain results of impure air. I have known a teacher, when he found his class in mathematics weary and perplexed with a difficult problem, instantly relieve them, and procure a speedy result, by letting down the tops of the windows, and thus sending a fresh supply of oxygen to the brain. Pure air adds as much to every other enjoyment as it does to the exercise of the intellect. This rule, then, may stand as first: *Take care that the brain is nourished with healthful blood and pure air.*

It has been shown that the nerves of *feeling* or *sensation* run from the front portion of the spinal cord, and the nerves of motion from its back portion. They then are united in the same cases, and are spread all over the body, thus united whenever motion is required. But the skin receives its supply from the nerves of feeling alone, which are abundantly multiplied in a close net-work of nerves. It is found by experience that there is an intimate connection between the exercise of the *nerves of motion* and the health of the brain and other nerves, so that these may be regarded as the *balance-wheel* of the whole nervous system. The neglect of the nerves of motion tends to produce a morbid sensitiveness of the other portions, while their appropriate action yields vigor, quietude, and enjoyment to every other function. Our Creator designed his creatures for industry and activity, in gaining good for themselves and for their fellow-beings, and to secure these a heavy penalty is affixed to inactivity of the muscular system. Every other instrument of the body becomes less susceptible to enjoyment, and more sensitive to suffering in proportion to the use or neglect of the nerves of motion. From this we see the importance of the second rule: *Take care that the health of the brain and nerves is secured by the daily and abundant exercise of the nerves of motion.*

Questions.—What example illustrates the influence of pure air on the brain? What is the first rule of health for the brain? From whence do the nerves of feeling and nerves of motion originate, and how are they united? From what does the skin receive its supply? What is said of the nerves of motion? What does neglect of these nerves produce? What is the result of their appropriate action? How did the Creator design that his creatures should gain good? And how has this been secured? How does neglecting to exercise these nerves affect other parts of the body? What is the second law of health for the brain and nerves?

The nerves of sensation, it has been shown, most abound in the skin, while in their origin and branches they are intimately connected and bound up with the nerves of motion. In this way the state of the skin influences very extensively the whole nervous system, more so than any other bodily organ. Therefore, the third rule is important: *Take care that the health of the brain and nerves is secured by a proper attention to the health and cleanliness of the skin.*

It has been found by experience that the health and strength of the brain and nerves is dependent on *sleep.* In this state the drain on the nervous fountain ceases, and it has a season for accumulating its resources. If there is not enough time allowed for sleep, there is a slow draining of nervous power which finally exhausts the nervous reservoir. On the contrary, if too much time is given to sleep, the system is exhausted by excess. Seven hours of sleep is the average, some require eight, and some but six. Eight hours of sleep is all that is needed by any healthy person, and more than this tends to debilitate the nervous system.

Any excessive fatigue, either of body or mind, demands an additional period of repose for the brain. Persons who use the brain a great deal, and under a strong pressure of care and feeling, require extra periods for sleep. The fourth rule, then, is important: *Take from six to eight hours of sleep as the general practice, but add more in cases of excessive activity of mind or body.*

In many cases the health of the brain and nervous system demands *amusements.* Any pursuit is an amusement which is sought simply for the *present* pleasure it affords, without reference to its future results. Pleasure is a healthful stimulus to the brain and nerves, while anxiety, care, and sorrow, have the opposite influence. And no mind or body can be a healthy one when every waking hour is de-

Questions.—Why does the state of the skin influence the whole nervous system? What is the third law of health for the brain and nerves? What is said of the influence of sleep on the brain? What is the state of the nervous fountain during sleep? What is the effect of too little sleep? What is the effect of too much sleep? How many hours should be given to sleep? When should extra periods of sleep be taken? What is the rule in regard to sleep? What is an amusement? What effect has pleasure on the brain? What effect have care and sorrow? Can any one be perfectly healthy in mind and body without some time for recreation?

voted to what are the business and duties of life without intervening periods of recreation.

There are no amusements so useful as those that excite laughter. There are a set of nerves called the risible, and portions of the brain and body which are exercised by laughter. These the Creator designed should be used, and all who have attended most to physiology and the laws of health, declare that nothing is more promotive of good health than a hearty laugh. In every family some portion of every day should be devoted to social and domestic enjoyments, in which amusements should form a part.

So strong is the love of amusements, and especially of those that excite merriment, that there is danger of excess. This danger has led many conscientious persons to shun altogether what requires only to be taken in moderation. From a want of just views on this subject there has been too often a marked line of separation between those who seek amusements and those who avoid them—one class going to one extreme, and the other to the opposite. At the same time, those who seek amusement are usually the class who least need it, while those who most need recreations entirely avoid them. There is no nation in the world that give so much time to study, care, and business, with so little intervening amusements, as the Americans, and this is one reason of the general decay of health. The fifth law, then, is important: *Let some portion of each day be allowed for recreation, especially by persons whose minds are burdened by cares and duties.*

It is found that a simple *change of pursuits* has a healthful and refreshing influence on the brain, even when these pursuits are severe. This is owing to the fact that a different portion of the brain, and different sets of nerves, are called into action, allowing others to rest. It is found, also, that *regularity and system* have a great influence in lessening

Questions.—What amusements are most useful? What nerves are exercised by laughter? What did the Creator design them for? What is said of a hearty laugh? What should some portion of every day be devoted to? What danger is there in this? What two extremes have there been on this subject? What is said of the Americans in this respect? What is the rule of health in regard to amusements? What is said of a change of pursuits? To what is this owing? What is said of regularity and system?

fatigue and care, so that a person that is systematic can accomplish far more labor, and with much less care, than can be done by one who has no such habits. The sixth rule, then, is important: *Let there be change and variety in employments, and at the same time system and order.*

The brain can be made to suffer as severely from *inactivity* as from any other cause. The want of some noble and engaging pursuit in life, leaving all the faculties and affections without appropriate objects, is one of the most serious evils that is suffered by the wealthy and prosperous. The selfish pursuit of pleasure soon cloys, and the mind pines for something noble to relieve. And this longing is always proportioned to the amount of talent and sensibility of each mind. A small, or a phlegmatic, or a low and uncultivated mind, can more readily become reconciled to inactivity, or a life filled up with trifles.

But the higher a mind rises in the scale of being, the nobler the intellect and feelings, and the more cultivated the powers, the greater the suffering consequent on inactivity, and the greater the longing for high and noble objects of pursuit. The seventh, and grand law, then, of health for the brain and nerves is, *that all the powers and feelings of the mind be engaged in the pursuit of noble and benevolent objects.*

But the brain and nerves can be made to suffer severely, even when the intellect and feeling are engaged in noble pursuits, by an unbalanced and unequal exercise of the faculties and sensibilities. This may be seen in the case of some benevolent persons, who select some single department of benevolent effort to turn all their energies and feelings into that channel alone. Their domestic affections, their social duties, the enjoyments of taste, the relief of recreations, and many other departments of mental activity included in a well-balanced and well-developed mind, are neglected. In this way the character is deteriorated rather

Questions.—What is the rule in regard to regularity and system? What is said of inactivity of brain? What is one of the chief evils suffered by the wealthy? What is said of selfish pleasure? What is the difference, in this matter, between a superior and a small mind? What is said of the increase of mental power and cultivation? What, then, is the chief and grand law of health for the brain and nerves? What is said of an unequal exercise of the faculties of mind? What case illustrates this? How is character affected by this course?

than improved, while the brain and nervous system suffer from an excess in one direction of activity, and from an equal neglect in another. Our Creator has given us no faculties of action or feeling which he did not design to have duly exercised in securing enjoyment to ourselves and to our fellow-beings. The eighth, then, is an important law of health for the brain: *Take care that all the faculties and susceptibilities of the mind and body be duly exercised so as to secure a well-balanced mind in a healthful body.*

Question.—What is the law of health in regard to the unequal exercise of the faculties of mind?

LESSON SEVENTEENTH.

LAWS OF HEALTH FOR THE ORGANS OF SENSE.

THE organs of sense are as dependent for health on their right use and proper treatment as any other portions of the body.

SENSE OF FEELING OR TOUCH.

The chief organ of this sense is the net-work of nerves of sensation in the skin. The health of these nerves depends mainly on these things:

First, that the blood be well oxydized in the lungs. Next, that the blood be made by simple and proper food. Next, that the skin be kept clean, and its capillaries well filled with blood. Lastly, that the nerves of motion and sensation, which are so intimately connected, be kept healthy by exercise.

SENSE OF TASTE.

In childhood the sense of taste is very acute, and children usually prefer food of mild and delicate flavor. The first use of pepper, vinegar, and the like, usually brings tears into the eyes. But the use of condiments and stimulating drinks so exhausts and dulls this sense, that a false appetite is created for unhealthful and mixed articles of diet. The use of tobacco lessens the sensibility of taste, and awakens an unnatural longing for stimulus.

The simple and natural taste of childhood can be restored by drinking nothing but cold water, and a perfectly simple

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Questions.—On what does the health of the organs of sense depend? What is the organ of touch or feeling? What are the four particulars that contribute to the health of this organ? When is taste most acute? What food is then preferred? What is the effect of the first use of pepper, vinegar, and other condiments? What effect do they produce? What is said of tobacco? How can a simple and natural taste be restored?

and healthful diet. When this is secured the appetite becomes healthful, and is a safe guide to the proper quantity of food. The rule of health, then, for this sense, is to *avoid every article that tends to debilitate this sense by over-stimulation.*

SENSE OF SMELL.

This sense is kept healthy and acute by proper use. But excesses in stimulating it diminish its sensibility.

Snuff is the great enemy of this sense. It diminishes the nervous sensibility, and thickens the membrane that lines the nose so as to obstruct the passage of air through it. This often affects the voice and mode of breathing. The same rule as the previous applies to this sense: *Avoid all excessive stimulation.*

SENSE OF SIGHT.

The organ of sight, like all others, can be debilitated by overaction. The eye may become inflamed by too much light, or it may be debilitated by too much use. This is especially true of those who have naturally a delicate organization. The first rule, then, is: *Avoid excess of light, and excess in using the eye. Always stop when the eye feels pained or tired.*

The iris is formed to contract when too much light enters the eye. But the process is a gradual one, so that sudden changes from darkness to light injure the nerve by excess of stimulation. A paralysis of the optic nerve (called *am-aur-o-sis*) is sometimes caused by this. This second rule, then, is important: *Avoid all sudden changes from darkness to light.*

If objects are placed too close to the eye for long periods it produces shortness of sight. If objects are viewed for a long time *obliquely*, it strains the muscles of the eye, and

Questions.—What is the consequence of this return to healthful diet? What is the rule of health for this sense? What is the effect of excessive stimulation of the sense of smell? What is the effect of snuff? What is the law of health for this sense? What are the two ways in which the organ of sight can be injured by excess? What is said of the action of the iris? What is sometimes the effect of excess of light? What is the second rule? What is the effect of putting objects too close to the eye? What of long-continued oblique vision?

sometimes produces *squinting*. Therefore this third rule is important: *Take care that the eye be not injured by too close, or by oblique inspection.*

When the eyes are weak, two things are especially injurious. One is using them early in the morning before breakfast, and the other is using them by candle-light. Gas-lights, which are a very strong light, should always be shaded for weak eyes. Local applications for weak eyes are dangerous, and should be avoided.

Rest and protection from light are the best remedies. Pouring cold water on the back of the neck is a safe, and often an effective application.

SENSE OF HEARING.

The ear is a very delicate organ, and its construction is not fully understood. Therefore, it is very important to preserve it from injury, and try no experiments with it.

Deafness is sometimes caused by an accumulation of wax in the ear. Great care should be taken not to use hard methods for extracting it. The cleaning of the ear with pin heads, or any hard thing, is dangerous.

A drop of oil in the ear will soften any hard wax, and then syringing the interior gently with tepid water, will remove the excess of wax. If this method does not relieve, recourse should be had to a physician.

Questions.—What is the third rule? What rules are given for weak eyes? How is deafness sometimes caused? What caution is given? What is the proper method of cleansing the ear from excess of wax, which sometimes causes deafness?

PART THIRD.

LESSON EIGHTEENTH.

ABUSES OF THE BODILY ORGANS BY THE AMERICAN PEOPLE.

We have noticed, in the two former portions of this book, the construction of the most important organs of the human body, and the laws of health in the treatment of these organs. The next portion of the work will point out the methods by which the American people violate these laws, and thus bring disease, deformity, and death on themselves, and educate their children for the same sad experience. This will be done under the same heads as have been taken in the previous pages.

ABUSES OF THE BONES AND MUSCLES.

In another portion will be shown how the American people take such a course in regard both to diet and fresh air, that the bones and muscles are provided only with impure and unhealthy blood. In shops, manufactories, offices, counting-rooms, sleeping-rooms, sitting-rooms, churches, school-houses, railroad cars, and almost every other place where human beings live, arrangements are made that, in nine cases out of ten, provide only impure air to breathe. Thus the capillaries of the bones and muscles never receive their proper supply of oxygen. This tends to make them weaker, softer, and smaller than they would be if nourished by blood properly oxygenized in the lungs.

At the same time the stomach being loaded with an excess of food, and this food wrong in its selection, can not

Questions.—What has been noticed in the two former portions of this book? What is to be pointed out in this third part? What course is taken by Americans both as to diet and pure air? What cases are mentioned to illustrate? What is their treatment of the stomach, and the consequence?

provide healthful chyle, and consequently there is a failure of proper nourishment for the bones and muscles.

It has been shown how much the health of the whole system depends upon the proper and uniform action of all the muscles, and also that this exercise is most serviceable when the mind is at the same time interested in attaining some worthy object by this exercise.

Now the labor appointed to man in cultivating the earth, in preparing its fruits, and in many mechanical pursuits, will be found to be that which exercises all the muscles of the body appropriately and healthfully. So also the labor appointed to woman in the family state, involves just that variety of employment which, if wisely adjusted, would be exactly what is best calculated to develop every muscle most perfectly, while in the performance of these duties the mind has healthful occupation.

And yet every man who can do so, avoids these healthful pursuits as less honorable, and seeks in preference those that shut him up in study, office, or store, to overwork his brain and leave his muscular system to run down for want of vigorous exercise and fresh air. And so almost every woman, who has it in her power, turns off the work that would make herself and her daughters beautiful, graceful, and healthful, to hirelings, and takes sewing, reading, and other inactive pursuits as her exclusive portion.

By this method of dividing the labor of life, one portion of the world weaken their muscular system, either by entire inaction of both brain and muscle, or by the excess of brain-work and the neglect of muscular exercise. Another large portion, having all the work that demands physical exercise turned off upon them, overwork their bodies and neglect their brains. And almost the whole fail in the *equal* training of the muscular system, which alone secures that perfect development on which health and beauty so much depend.

Owing to the above causes, the great majority of the pres-

Questions.—What has been said of the exercise of the muscles? What is said of the labor appropriated to man and to woman? What are the practices of men and women in respect to these labors? What is the consequence of this wrong method of dividing labor?

ent generation have grown up with bones and muscles to a greater or less extent weaker, smaller, and less healthful, than their Creator designed they should be. His work has been marred and enfeebled by their own abuse and neglect, or by that of their parents or other ancestors.

Having thus prepared the bones and muscles by debility to yield readily to any injurious influences, a large majority of the mothers and daughters of the nation adopt a style of dress that is exactly calculated to produce disease and deformity.

In the first place they dress the upper portion of the body so thin, that the spine and chest are exposed to sudden and severe changes of temperature in passing from warm to cold rooms, and this tends to weaken that portion. Then they accumulate such loads of clothing around the lower parts of the body, as debilitates the spine and pelvic organs by excess of heat. At the same time, they bind the ribs so tight, that there is a constant lateral pressure against one side of the spine, tending to produce a curvature that distorts one shoulder and one hip. At the same time the weight of clothing on the hips and abdomen presses down on the most delicate and important organs of life to move them from their proper positions, while pointed bodices, with whalebone pressure, co-operate as a lever in front, to accomplish the same shocking operation. The efforts of the Chinese mother in binding up her child's foot to distortion, is wisdom compared with the murderous folly thus perpetrated or tolerated by thousands of mothers and daughters in this Christian and enlightened age and nation. And the most terrible feature in this monstrous course is, that the evil thus achieved by a mother is often transmitted to her deformed offspring.

Besides these methods for distorting the muscles and bones others quite as effective are adopted.

Questions.—What is said of the effects of this division of labor on the bones and muscles? What do a majority of women do as it respects dress? What is there wrong in the fashion for the upper portion of the female form? What for the lower portion? What evil is done around the ribs? What is done by the weight of clothing? What whalebone pressure has been added? Can the deformity thus induced become hereditary?

Some children are made to sit still for hours on seats at school that do not properly support the body. Thus some of the muscles are debilitated, by over-exertion, to hold up the body, and finally failing, the discs of the spine are forced into the hardening process to supply the place of the muscles.

Other children are allowed to sit so many hours in wrong positions, either while reading or writing, as to bring on deformity by a similar process. Other children sleep on high pillows and in such uniformly wrong positions as induces deformity. Others are allowed to sit and stand in positions that lead to deformity.

Then again, when the evil results of those methods begin to develop, and the child is seen to be growing up with crooked back, or projecting neck, or round shoulders, or all together, instead of ceasing the wrong treatment and securing proper exercise, diet, and fresh air as the only true remedy, *braces* are girt around the bones and muscles to increase the very evil they are used to remedy.

Then, when it is discovered that *exercise* is needed for a remedy, the habit is so suddenly invaded as to weaken instead of giving strength. The slow and gradual change would, indeed, meet the evil, but the sudden jerk only adds to it. And then the plea is made that exercise is found by trial to do more harm than good.

There is one mode of *exercise* that is very common, and is earnestly defended on the ground of its healthful tendencies, and that is *the dance*. There is no doubt that the Creator, when he implanted that strong love of measured exercise to the sound of music, intended that it should be gratified. And were it the custom for families to go abroad into the open air, in proper habiliments, at proper times, and dance to the sound of music, and this were the only mode adopted, it is probable that no such prejudice as now exists against this amusement would have arisen. But how is the dance usually conducted?

Questions.—How are children injured in schools by the seats used? How are they injured by wrong positions? How by positions in sleeping? When deformities are thus created, what wrong remedies are used? What mistakes in regard to exercise? In what circumstances would the dance be healthful?

In the first place, it is commonly in the night season, when quiet is better than exercise. Next, it is in rooms where the air is vitiated by many lights and many breaths, and where quiet is far better than a quickened circulation. Next, the clothing of the female portion of the performers is usually the very worst that could be selected for such an occasion—too thin about the chest and too heavy below it. Then, before the night is passed, the stomach, which should rest when the muscles are exercised, is loaded with the most unhealthful of all kinds of food, condiments, and drinks. Finally, after the skin, stomach, and lungs have been debilitated by hours of abuse, and the whole brain and nervous system exhausted by mental and physical excitement, the company adjourn to cold halls and robing-rooms, and go forth to ride through the night air, with weary, sleepy drivers, to weary, sleepy servants or friends, whom selfish amusements have deprived of proper repose and sleep. When another generation has been trained to understand and obey the laws of health, the beautiful and health-giving dance will be rescued from its profanation and abuse. But in its present state of degradation entire abstinence is probably the safer rule, for those who venture only a few steps will probably be soon drawn far beyond their first intentions, while their views of right and expediency will gradually sink to the standard of their wishes, or yield to those of their children.

ABUSES OF THE LUNGS.

It is the universally-acknowledged fact, that the present generation of men and women are inferior in health and in powers of endurance to their immediate ancestors. And in all quarters the cause is sought, while many varying answers are given.

It is probable that no *one* cause can be assigned as the sole reason. But it can be made to appear probable that the

Questions.—What is wrong as to *time* in regard to dancing as usually conducted? What is wrong as to the air? What in regard to dress? What in the treatment of the stomach? What is the last evil described? When will the dance be probably rescued from such abuses? What is the safer course till this is done? What is an acknowledged fact?

abuse of the lungs by supplies of impure air has had more influence than any one thing in the general decay of health. Our ancestors always slept in cold and well-ventilated chambers. And in the family by day, the broad-mouthed chimney and uncorked doors and windows secured a constant flow of cool and pure air, while daily exercise in family work by women and children, and out-door work by men and boys, secured the cheerful spirits and healthful exercise most favorable to body and mind.

But as wealth and luxury have increased, houses have been made tight, windows have been corked, fire-places have been shut up, and close stoves and furnaces introduced. Men work in heated counting-rooms, offices, stores, shops, and manufactories, with brain stimulated and muscles inactive, or with both muscles and brain stimulated, while the fetid effluvia of many skins and lungs accumulate as the only fountain of supply to the lungs and the dependent capillaries all over the body. Then they go home and sleep with wives and children in close, unventilated, and sometimes heated rooms. And even when they travel, especially in winter, when the cold and pure air would most invigorate, they are packed in close cars, with a stove burning up the oxygen and thinning the air, while windows are fastened down and every crack made air-tight with frozen breaths. The idea that every pair of lungs needs a hogshead of pure air every hour as much as the stomach needs its daily food, is one that has never been acted on by one man in a thousand in arranging for his house, his place of business, and his family.

If society understood this subject as it will some day be considered, there would be health-officers to inspect every house in the land, and bring indictments for crime against every man that arranges to poison himself and his family by an unhealthful atmosphere.

One grand difficulty on this subject is, that the philosophy

Questions.—What has had more influence than any one cause in producing a general decay of health? How was sleeping and work done in a former generation? What has attended wealth and luxury? How do men work, how do they sleep, and how do they travel? How much fresh air is needed every hour for every pair of lungs? What sort of health-officers will exist when this subject is properly understood?

of ventilation has been so little attended to, practically, that not one in a thousand even of educated persons, not one in a hundred even of those who have studied physiology, and consider pure air as important to health, really know what is necessary to secure a proper ventilation.

The thing to be done is to secure a *gentle current* of air, which shall constantly pass in and out of a room or building where the lungs and skin of human beings are vitiating the atmosphere.

This being so, it is a very easy matter to ventilate any room, by simply having an opening at the top of one window and another at the top of a door. The size of this opening must be proportionate to the number of lungs that are to use the air. In a common-sized chamber, with two lodgers, an inch at the top of a window and an equal opening over the door, will ventilate sufficiently.

In ventilating a room, care must be taken that the current be not so large and so strong as to be sensibly felt by the inmates, as this will cause colds. There must be a gentle, imperceptible current established; and where a great deal of air is needed, to meet the wants of many inmates, several small openings must be made instead of any large one.

Churches and school-houses are best ventilated by furnaces placed under, and opening at one end of the room, while the ventilators at the top of the room should be at the opposite extremity. This makes a current pass through the whole house.

But if the furnace and ventilators are placed over each other, the current does not so entirely affect every part of the room, while the warm air passes off faster.

The collecting of large numbers of human beings in one building, to spend both day and night, always involves the gradual dilapidation of constitution to all, especially to the most susceptible, unless uncommon care is taken to provide a proper supply of pure air. All the rooms should open

Questions.—What is one grand difficulty? What is to be done in order to obtain proper ventilation? What arrangement would secure this? What care is needful in ventilating? How is it to be managed? How are churches and schools best ventilated? Where many persons live in one large building, how should it be ventilated?

into long halls that are constantly swept by the outer air from opposite doors and windows. At the same time ventilators should open from each room to these halls, and then another opening be made to the outer air at the top of each window in every room.

But institutions could now be pointed out, where physiology has been taught for years, and yet where two or three hundred live, month after month, breathing chiefly impure air. In neither basement, kitchen, nor dining-hall, where the inmates perform daily exercises, are any *proper* arrangements for carrying off the impure air, vitiated by hundreds of lungs. School-rooms and lodging-rooms are equally unprovided with *proper* ventilation. Meantime the young inmates have their brain and nervous system on a constant drain by intellectual activity and moral responsibility. And then as, year after year, we hear that fevers and various diseases sweep off the young inmates by death, or send them home to recruit, their friends are all wondering what *can* be the reason there is so much sickness there!

So in our manufactories and shops of labor, thousands of the young congregate to labor in poisonous air, till their constitutions are undermined, and then return home to remain invalids for life.

To add to all the mischief of vitiated air, young women are generally girt so tight around the body, that the lower part of the lungs, where the air-cells most abound, are rarely used. *Abdominal breathing* has ceased among probably a *majority* of American women. The ribs also are girt so tight, in many cases, that even the *full* inspiration at the *top* of the lungs is impossible. And this custom has operated so, from parent to child, that a large portion of the female children now born have a deformed thorax, that has room only for imperfectly-formed lungs. The full round chest of perfect womanhood is a specimen rarely seen, and every day diminishing in frequency.

To these abuses of the lungs are to be added the multi-

Questions.—What cases are mentioned showing the evils of a want of proper ventilation? What is said of shops and manufactories? What is said of the dress of American women, and its effects? What common distortions serve to cramp and injure the lungs?

plied distortions caused by long-continued unnatural positions at school or at work, that cause round shoulders and bent forms, by which the lungs are cramped in size and action.

In many cases the attempt to ventilate rooms by ignorant or heedless persons is a serious evil. Such will wait till a room is hot, and its air almost poisonous, and then—when the skin of all its inmates is reeking with perspiration—open a door or window, and make a strong and direct draft, that, of course, causes colds and injurious chills. By this method many are so annoyed as to really hate ventilation and all its advocates.

The only proper and safe method is to have such arrangements made that a room is always perfectly ventilated at all times, and by such a process that no strong current is made in any direction. A window open at top, with a thin curtain over, on one side of a room, and another window or door, with a moderate opening, on the other side, suffices where there are few persons. When there are many, there must be a multiplication of the number of ventilating openings.

Questions.—How are persons sometimes injured by ventilation? What is the only proper and safe method?

LESSON NINETEENTH.

ABUSES OF THE DIGESTIVE ORGANS.

IT has been shown that the health of the body is very dependent on the proper selection and proper amount of food.

In regard to the selection of food, it has been shown that there are these general classes:

First, animal and vegetable, which do not differ essentially in their constituents, both having exactly the same primary elements. The main respect in which they differ is, that animal food is more stimulating (not more nourishing) than vegetable, by which is meant that it tends to make all the organs of the body work faster. It is the predominance of *nitrogen* in animal food that gives it this stimulating quality.

Next, there is the *heat-forming* and the *flesh-forming* kinds of food. The heat-forming are those that supply most abundantly the carbon which is to combine with oxygen in the capillaries, and thus furnish fuel for the fires that cause animal heat. The stomach supplies the carbon to burn, and the lungs supply the oxygen to consume it. Butter, fat, oil, sugar, and molasses are the most prominent articles of this kind. The flesh-forming food is that portion which is most readily incorporated into the body as muscle, and does not furnish so large a proportion of carbon for animal heat. All kinds of grain, vegetables, and fruits, contain both the flesh-forming and the heat-forming ingredients. Indeed so do a greater portion of the articles of food. The classifi-

Questions.—On what is the health of the body very dependent? What is the first division of food? What is the chief point of difference? What is meant by food that is *more stimulating?* What gives this quality? What is the second division? What is the heat-forming kind? What is done by the stomach, and what by the lungs? Which are the chief articles of this kind of food? What is the flesh-forming? Do most kinds of food contain both?

cation relates only to the *predominance* of one or the other quality.

Next, there are the *nutritious* and *innutritious* kinds of food. The most nutritious are those that yield the largest quantity of nourishment in a given bulk. The innutritious food is that which is not assimilated into the body, but is useful, by bulk and stimulation, in forwarding the process of digestion. For food that is highly concentrated, so as to have a great deal of nourishment in a small bulk, does not digest alone so readily as when mixed with innutritive matter.

Finally, there are the *digestible* and *indigestible* kinds of food, which are classed with reference to the ease and speed with which they are carried through the process of digestion.

This account of the different kinds of food is recapitulated to show the philosophy of those laws of health that regulate *the selection of diet.* These rules indicate that knowledge, prudence, and discretion are needed in order to regulate the selection of food with reference to *climate, seasons, age, temperament, state of health,* and *nature of employments.* Those who live in a hot climate need a different diet from those living in a cold. The food of the summer should be modified from that of winter. The young should not eat some food that is suitable for the aged. Persons in one state of health, or with weak powers of digestion, should not take certain articles that are proper in other circumstances; while persons who are engaged in sedentary employments may not take what would be safe to persons exercising constantly in the open air.

If the American people were a strong, hardy, unexcitable race, like the German laborers that come among us, such rules for the selection of diet would be of less importance. But if it should appear that probably a majority of our people are either invalids, or fast hastening to that condition, the matter becomes far more worthy of attention.

Questions.—What does the classification relate to? What is the third kind? What are the most nutritious? For what is the innutritious part of food useful? What is the fourth kind? What is needed in order to regulate the selection of food? What is said of those who live in a hot climate? What of food in summer and winter? What of the young? What of those with weak digestion? What of sedentary persons? What is said of Americans as compared with Germans?

The course which has been pursued by a large number who have attempted to teach the public on this subject, has served greatly to embarrass and perplex. A great portion of such writers seem to be mounted on *hobbies*. Some advocate an exclusive vegetable diet, and in such an extravagant way as to make the impression that nothing is quite so bad for the human race as eating meat, and that most of the physical and moral evils of society would be ended by the adoption of a farinaceous and vegetable diet.

On the other hand, those who advocate a mixed diet, including animal food, write as if no man could become perfectly developed physically without meat. The impression is made that bread and vegetables, which really contain far more nourishment in a given bulk than any meat, is a *low* diet; that there is nothing that is so *nourishing* as a good piece of beef-steak; and that the poor creatures who have been kept for months on bread and butter, milk, fruits, and vegetables, must be "strengthened and built up" by porter, wine, and meat.

Then, again, certain articles of food will be hunted down as if in all cases and all circumstances they were rank poison; while others will be selected as good for all mankind in all circumstances.

But what is needed on this subject is, that the people should learn the construction of their own bodies, the nature of different kinds of food, and the laws that should regulate their selection, and then that they should use their judgment and common sense in this as in all other matters. At the same time habits of self-control and principles of duty are needed to secure obedience to the dictates of discretion. For want of all this, the great bo‿, of the American people are following a course which, in multitudes of cases, leads to certain disease, and shortens life.

In the animal kingdom there is no creature that does not succeed better than man in raising its young. It is calcu-

Questions.—What injudicious methods have been pursued by persons who have taught the public on this subject? What has been said of animal and vegetable diet by such? What of certain kinds of food? What is needed on this subject? What is the consequence of the want of this? **What is said of the comparative success of men and other animals in raising their young?**

lated that nearly one-third of the human race perish before they reach their third year; while no such mortality as this exists among the young of irrational animals. We shall see the reasons for this, as we trace the various methods which are taken that are destructive to the health and life of young children.

In regard to the selection of food, there is no physician of any school but what allows that meat is more *stimulating* than any other food, and should be avoided whenever there are any tendencies to fevers or inflammation. All concede, also, that children are more excitable, and more liable to inflammatory attacks than grown persons. And yet the great mass of children in this country begin to eat meat the first and second year of life, which is the period of greatest danger from feverish and inflammatory attacks of all kinds. And it is often the case that meat is allowed twice, and sometimes thrice a day.

Little attention is paid to the peculiar temperament of children in regulating diet. A child of full habit that tends to inflammation, needs one course; while a child of thin blood, phlegmatic temperament, and slow movement, is safe with a diet that would destroy the other.

So in cold weather, a diet which is safe and proper, may be very injurious in the heat of summer. As a general rule, children are safest and healthiest who eat little meat, little sugar, molasses, butter, and fats, and live chiefly on bread, milk, fruits, and vegetables.

The combustion in the capillaries, which produces animal heat, requires that there should be *some* carbonaceous food, especially in cold weather. Butter, sugar, and molasses, being of this class, therefore need not be entirely relinquished, except where there is an excess of *bile*, or certain corruptive humors.

But the American people use these articles to an excess

Questions.—What do all physicians allow in regard to a meat diet? What do they concede in regard to children? And yet what are children allowed to do by most parents? What is said of the inattention to the temperament of children? What is said of the diet of cold and warm weather? What is the best rule for children? What is it that makes some carbonaceous food proper? Which are the articles of this class? When only should they be entirely relinquished?

such as is seen in no other country. It is only those who exercise a great deal in pure air that can afford to use these carbonaceous articles freely.

This being so, the quantities of butter, molasses, and sugar heaped on to hot cakes—the meats, gravies, and fatty cooking—the stimulating condiments, and the candies and confectioneries that abound, are all so many sources of debilitation, disease, and death to the young.

In addition to this, children are allowed tea and coffee, which stimulate the nerves and brain, while the heat of these drinks tends to debilitate the stomach.

The adult population of our country pay little regard to the rules of prudence in selecting their food. Men of full habit and excitable nerves will eat meat and drink tea and coffee and other stimulating drinks, without the least knowledge or fear of the probable consequences. In summer meat and carbonaceous food is taken just the same as in winter, while the stimulating condiments are freely used. In our newer settlements, where most care and caution are important, meat at every meal, coffee twice or thrice a day, and hot bread, with other of the most indigestible kinds of cooking, abound; and in summer the same as in winter.

Of this kind of unhealthy cooking, one of the most pernicious is articles in which *soda* and *saleratus* abound. The immense quantities of alkalies thus introduced into the stomach is astonishing.

It is probable that a description of the most unhealthy and improper meal that could possibly be provided would include exactly what is found on the tables of a very large portion of, as it respects wealth, our most thriving population. And thus it is that the wear and tear on the constitution prepares the way for acute attacks that end life, or for chronic disease that beclouds all its enjoyments.

But the greatest evil is probably accomplished by the excesses in *quantity* of food. The great evil of condiments is

Questions.—What is said of the use of these articles by the American people? Who can use them freely with safety? What are the causes of disease and death to many children? What other mischievous articles are allowed to the young? What pernicious courses are pursued by adults? What is said of the *quantity* of food taken?

not so much their influence on the circulation as the unnatural stimulation of appetite that they produce. This leads almost every person who uses them to take more food than the body demands, which overtaxes the system in throwing off the excess. In addition to this, the great variety of food which our country's abundance provides is another temptation to excess. Many persons eat after the appetite is satisfied simply to gratify the palate with some tempting viand.

The evils of excess in quantity of food are particularly injurious to children. The strength which would otherwise be employed in perfecting all their organs and functions is used up in relieving the system from the excess of needless food.

As a general fact, the more wealthy and prosperous a community becomes the more food and the less exercise is taken. To those who exercise a great deal in the open air there is less need of care, both as to selection and quantity of food; for the quickened circulation and good supply of oxygen meet the evil with less injury. But to those who have little air and little exercise the tempting varieties of the table, instead of a blessing, are a daily curse.

Here, however, there is need of caution in reference to books and papers that attempt to prescribe by weight how much every body should eat. Some persons require more food than others, and more is needed by the same person at one time than at another; and it is folly to guide all by one rule. If all will exercise enough, live in pure air, avoid stimulating condiments, and persevere in a plain and simple diet, *a healthy appetite* will return; and this will be a steady and safe guide. Until this is secured, it is always safest to *stop before there is a sense of fullness and satiety.*

In regard to the *time* and *manner* of taking food, the Americans are celebrated for violating the rules of health.

Questions.—What is the chief evil of condiments? What tempts to excess besides condiments? What are the consequences to children of excess in food? What is the common effect of wealth and prosperity? What is a loaded table to those who exercise but little? Can all persons be regulated by the same rule as to quantity of food? How can a healthy appetite be restored? What is a safe rule when it is wanting?

In the first place, the rule requiring that there should be a period of rest to the brain and muscles before taking food is rarely regarded. Students and men of business rush to their noontide meal with brains throbbing with excitement and the circulation all disarranged. And the laboring classes do the same in reference to their excited muscular system. Both should allow half an hour of quiet to mind and body before setting the stomach to its labors.

In the same way the stomach is hurried in all its operations. Food is thrust into it half masticated, and one bolus follows another before the needful process for each can be effected. Half an hour is the shortest time that should be allowed for a meal; and yet probably a majority of the busy workers of this nation do not allow much more than half this time.

Then, as soon as the stomach is thus improperly loaded, the brain, nerves, and muscles are all set to work again—thus drawing off the blood needed by the stomach to perform its digestive process.

Many persons, after eating their three meals a day, will load the stomach just before going to sleep, and thus keep up the labor of the system during its feeblest period, and when all its powers should rest.

Irregular periods of eating for children, and the candies and other confectionery so common in these days, are a prolific source of debility and disease. By these indulgences the stomach is taxed at all hours of the day, with short periods to rest. New food is constantly mixed up with that which is partially digested, while sweets of all kinds are the carbonaceous food that requires much exercise and much oxygen from the air to dispose of it safely. And yet city children and little pets, who seldom are allowed to romp in fresh air, are most abundantly supplied with these pernicious articles.

Questions.—Do Americans obey the rule that requires *rest* after exercising the muscles or brain before eating? How much rest should be allowed before eating? Do Americans give time enough to masticating and digesting their meals? What is the shortest time proper for a meal? What is the effect on the stomach if the brain or muscles are set to work immediately after eating? Why is it bad to sleep immediately after a meal? What is said of irregular times of eating, and of cakes and candies for children? What evils follow?

Candies and sweet articles are highly concentrated nourishment that ought, when eaten, to be mixed with coarser food in order to secure proper digestion. This kind of food is more likely to turn acid on a weak stomach than any other, while none so surely tends to produce constipation.

An enormous abuse of the stomach and other digestive organs is from the quantities of quack medicines that are taken in this country; while the giving of *family* medicines by parents is scarcely less an abounding evil.

The grand objection to the taking of medicines, except when prescribed by a judicious and well-educated physician, is, that most of them are either poisonous substances or strong stimulants that strain all the animal economy to discharge them from the body; while their operation and results are matter of mere chance and *guess-work*. Whatever is put into the stomach is quickly taken into the circulation, and carried all over the body; and if it does good in one point of the wonderfully complicated organs, it may do as much harm to other portions.

Besides this, there are curious *chemical* changes going forward in our bodies that none fully understand; and how these medicinal agents will operate to produce new and mischievous combinations no one can tell.

And yet men, women, and children, all over the land, are pouring down medical liquids and pills to an incredible extent; while vast fortunes are made by ignorant quacks who, by lying advertisements, succeed in poisoning their fellow-creatures by slow processes.

The abuse of the stomach, brain, and nerves by stimulating drinks, has become so terrible in this nation that the whole country is roused to put an end to *one kind*, *i. e.*, the *alcoholic* articles.

But the tea and coffee stimulants that are undermining the constitution of women and children, and the tobacco smoking and chewing which are ruining the health and creating dangerous appetites for so many young men, still hold

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Questions.—What is said of candies and sweet articles? What is said of quack medicines? What is the objection to most medicines? What is said of *chemical* changes in our bodies? What is said of alcohol and of tea and coffee?

their place even among conscientious and Christian people. The light that drives away the demons of alcoholic stimulation, it is hoped, will gradually chase these kindred associates that hover over the feebler sex and helpless childhood.

The "temperance reformation," as it is called, rests entirely on this principle, that "whatever is found by experience to prove extensively destructive to *health and morals*, and at the same time *entirely needless*, shall be relinquished both for use and traffic. And where individuals, without *apparent* injury to themselves, can continue the indulgence, they shall relinquish it as *an example*, and to save others from temptation."

This principle applies as exactly to opium, tobacco, tea, coffee, and condiments as it does to alcohol. All these contain a stimulating principle that is not ever *necessary* to the health of the body except as medicine, which creates an unnatural excitement of the brain and nerves, and which experience has shown to be destructive to health, and thus also to morals. Some of these are worse than others in their effects, but all are alike in being needless and the cause of extensive injury.

Whenever, therefore, conscientious persons become *consistent*, they will abandon both the traffic and use of *all* stimulating drinks and drugs.

But, at present, thousands of such persons are going on in daily violation of as decided a law of health as any that God has established. For there is no maxim that physiology and medicine have more clearly proved, than that the stimulation of the nervous system by alcohol, opium, tea, coffee, tobacco, and condiments, is *invariably* followed by a *debility* exactly proportioned to the degree of stimulation. It may be unperceived, but it is certain. And thus a thousand little daily drains are silently emptying the fountain of nervous energy on which long life and the power to resist disease are dependent.

Questions.—What is the principle on which the temperance reformation rests? To the use of what articles does this apply? What kind of article do they all contain? In what do they differ, and in what are all alike? What will be the result when conscientious persons become consistent? What maxim is established by physiology and medicine? What is the result?

LESSON TWENTIETH.

ABUSES OF THE SKIN.

We have seen the curious construction of the skin, and the important work it performs in regulating the heat of the body, and in discharging through its pores decayed and poisonous matter that is drawn off by the veins and lymphatics. *Twenty-eight miles* of perspiration tubes, all lined with infinitely small capillaries, are placed all over the skin, and through these *five-eighths* of the weight of daily food and drink are discharged.

The decayed particles of the body accumulate on the skin, and thus every portion of it needs to be washed *every day*. And yet probably more than one half the American people never wash *the whole body* from one end of the year to the other; the face, neck, arms, and feet, being the only portions enjoying this privilege. Even a large part of those who occasionally wash the whole skin, do it only once a week, or perhaps once a month.

In consequence of this, not only the skin itself becomes unhealthy, and less and less able to perform its functions, but the internal organs so intimately connected with it become weak and disordered, being forced to do a portion of the duty that, in a healthy state, the skin would perform. The liver and the lungs are the special sufferers from this neglect and abuse.

The skin is a great sufferer from the methods taken by multitudes to keep it warm. The true method is to supply the blood of its capillaries with enough oxygen through the lungs, and to keep it in a healthy state by washing, friction,

Questions.—What are the two offices performed by the skin? How many miles of perspiration tubes are there in the skin? How much is discharged through these tubes each day? What is needed every day? What is the common practice among the American people? What is the consequence of this? What two organs are the chief sufferers from this neglect? What is the true method of keeping the skin warm?

and exercise. When the blood-vessels are habitually filled with good, healthful blood, there is a warmth generated on the surface of the body, so that but little clothing is required. But when the skin grows weak, and its capillaries imperfectly filled, there is a necessity for increasing the amount of clothing to prevent injurious chilliness.

Too much clothing tends to debilitate the skin: in the first place, by excess of warmth; next, by causing frequent perspiration when sitting in warm rooms; and finally, by excluding all access of the surrounding air. The unequal method of arranging the clothing of American women is a most fruitful cause of evil to the skin, as well as of diseases that have been referred to elsewhere. The upper portion of the body is dressed too thin, while the lower portion has such an excess gathered around it, as is a constant cause of debility to the skin as well as the internal organs. By this arrangement, on passing into cold rooms the upper portion of the skin is chilled, and the blood retreats to other parts of the body. Then when in warm rooms the lower portion of the body becomes excessively heated and debilitated by the consequent perspiration and warmth. The spinal cord, which is the parent of most of the nerves, is thus debilitated by chills in its upper portion and heat in its lower.

Instead of this, the whole body should be dressed very nearly with the same amount of covering, except that the feet need more care than any other part. The reason of this is, that the circulation is slower in the extremities, and any interruption there affects the whole body more injuriously than in any other quarter.

And yet there is no part of the person which fashion so much excludes from needful warmth and protection as the feet, especially among the most delicate and sensitive classes of the community. Multitudes of fashionable ladies, and the foolish women and young girls that imitate them, wear

Questions.—What is the effect of keeping the blood-vessels of the skin filled with good blood? What results from the opposite course? What is the effect of too much clothing? What is said of the style of dress among American women? What is the consequence when the upper part of the body has too little clothing? What is the effect of having the lower portion loaded with too much clothing? What is the effect of both on the spinal cord? How should the whole body be dressed? Why do the feet need most care?

only a thin pair of hose and thin slippers in damp and cold weather, both in walking over cold floors and in the streets. Thus the circulation in the lower limbs is impeded, and the blood accumulates in the organs above to an unhealthful amount. There is another abuse of the feet which few understand. It is thus set forth by an able hand:

"There might be much said on the subject of *shoes*, as connected with health, and it is of more importance than it would at first sight appear.

"Shoes are generally made without the slightest regard to the form of the foot—a mere matter of fashion. The want of *width* and *fullness* at the toes is the great evil.

"The effects upon health are—the pressure impeding circulation seriously, destroying the elasticity of the foot and all *spring* in walking, making it so painful that the necessary exercise is avoided.

"The deformity is a secondary matter, yet it is a *painful subject* to one who has examined the *general run* of feet with reference to a model for a sculptor among them."

The skin also is abused both by neglect of ventilation and by the foolish methods taken to promote it. No part of the body suffers so much as the skin from a close, heated, and impure atmosphere. In this condition all its capillaries are deprived of the oxygen needed to purify the blood, while they are stimulated to excess, and debilitated by heat and perspiration.

Then some wiseacre will discover that the room needs ventilating, and open a window and door, which let in a current of cold air on to the skin at just the very time it is least able to bear it. Thus a cold is taken, and the sufferer is made to feel that all attempts to ventilate a room are folly and cruelty.

The skin is also abused by mistakes and excesses in bathing. A person unused to cold water should always commence its use with caution and moderation, beginning with tepid water in a temperate atmosphere, and increasing the

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Questions.—What is said of the usual treatment of the feet? What is the consequence? What is said of improper ventilation and its effects on the skin? What wrong mode of ventilating is mentioned? Can bathing be so abused as to injure the skin? How should one unused to cold bathing proceed in attempting it?

cold as the skin and nerves gain strength. And the time and frequency of bathing should be regulated by the amount of animal heat and nervous power. Unaware of the need of these precautions, many persons injure the health of the skin and other organs by bathing in too cold water, or by practicing it too often or too long. The cold shower bath is a very strong and stimulating bath, and is not safe for children or for persons of a nervous or excitable temperament.

Questions.—By what should the time and frequency of bathing be regulated? What has resulted from a want of these precautions? What is said of the shower-bath?

LESSON TWENTY-FIRST.

ABUSES OF THE BRAIN AND NERVES.

The following particulars have been illustrated in former lessons:

First; that the brain and nerves are the organs by which the mind controls the body, and that they are divided into distinct portions, each of which has a peculiar work to perform.

Secondly; that each brain has a fountain of nervous fluid which excites the nerves, and that the capacity of this fountain varies in different persons.

Thirdly; this fountain may be exhausted by *excess* of mental feeling and action.

The *unequal* action of the several functions of mind and body, by which some are strained by excess, and some debilitated by inaction, also tends to exhaust the nervous fountain.

Whenever there are violations of the laws of health, the brain and nerves are taxed, by unnatural or excessive action, to remedy the evil. This tends to exhaust the nervous fountain, and thus to undermine the constitution.

For example, when the lungs inhale impure air, the brain suffers, first, by the loss of its own proper supply of oxygen, and next, by the increased and unnatural supply of nervous fluid sent to the organs that must work harder to remedy the evil.

Again, if the stomach is loaded with excessive or inappropriate food, the brain suffers from the bad blood furnished, and also is forced to send extra supplies of nervous fluid to the organs that must labor unnaturally to relieve the system.

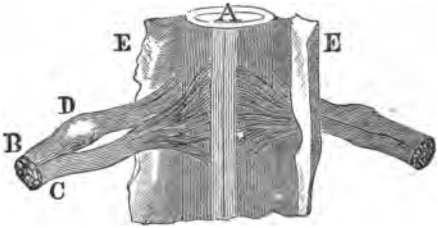
Questions.—What is the first particular that has been illustrated? What is the second? What is the result of violations of the laws of health? What evil results from this? What three examples are given to illustrate this?

So, also, if the skin is neglected, the brain must minister unnatural supplies to the other organs that labor to relieve the evil.

Now every drain on the nervous fountain is a slow and sure *undermining of the constitution*, which shortens life, and renders the body more subject to diseases of all kinds.

As there is no law of health that is of more consequence than that which relates to the *nerves of motion*, the following drawing is presented to impress the subject more strongly.

Fig. 40.



A, the spinal marrow. E, a portion of its membrane, or skin, loosened to show the nerves. D, a nerve of sensation starting from one side of the spine. C, a nerve of sensation starting from the other side of the spine. B, the union of the two in one case.

Most of the branches from these trunks contain nerves of sensation and nerves of motion united in one case.

The drawing shows a small portion of the spinal marrow at A. On each side is a nerve of motion starting from the back portion of the spine. A nerve of sensation on each side also starts from the front portion of the spine, and then unites with the nerves of motion. The branches of these run to the muscles, and each branch has a nerve of motion and a nerve of sensation united in the same case. Thus in all the muscles the nerves of sensation feel and report to the brain, while the nerves of motion move the muscles.

Now it seems to be the one great office of the nerves of motion to *equalize* the nervous fluid and regulate its health-

Questions.—What is every drain on the nervous fountain, and what is the effect? Describe the draining? What is the office of the nerves of motion and sensation in the muscles?

ful flow to all portions of the system. For this reason, inactivity of the muscles tends to an irregular and inharmonious flow of nervous energies, until finally there ceases to be a healthful and natural distribution of it. From this results many of the strange and troublesome feelings that go by the general name of *nervousness.*

The more the thoughts and feelings flow with great strength and for a long time in one direction, the more need there is for that equalization of the nervous fluid which muscular activity alone can secure. And when this is withheld, the sensibility of the other portions of the brain is liable to become excessive, unnatural, and less under the control of the will.

We are now prepared to notice the abuses of the brain and nerves that prevail among the American people.

In the first place, then, there is a slow, yet almost universal *undermining of the constitution* going forward by those violations of laws of health that most drain the nervous fountain.

It is probable that a great majority of this nation sleep in badly-ventilated rooms, take improper food in excessive quantities, and in wrong times and modes.

Thus the brain is overworked to aid the other suffering organs when its own supplies are imperfect.

Probably more than one-half of the nation entirely neglect the proper care of the skin, thus taxing the brain again, in sending unnatural supplies to the other organs that must remedy the evil.

Next, a large portion of the people abuse the brain either by want of sleep or by excess of it. Eight hours of sleep is as much as is needed by any healthy person who labors hard either with brain or muscles. Yet most of those who labor least spend far more than this in sleep. All excess of sleep is a slow and gradual drain on the constitution, and the want of sleep is still more so.

Then the people of this country are more excited by cares, business, politics, and religion, than any other. And

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Questions.—What is the first abuse mentioned? What is said of bad food and ventilation, and the effects? What is said of the neglect of the skin? What are the abuses in regard to sleep?

yet multitudes overwork the brain and nerves of feeling with study, business, care, and agitated feelings, without seeking that equalizing and healthful influence that the exercise of the nerves of motion would secure. The great body of students and professional men are great sufferers in this respect.

Then a large portion of the laboring classes exhaust the nervous fountain by excess in muscular labor, unrelieved by amusement and intellectual pursuits.

Thus the men of study, or those of business, sleep all night in bad air; then they go to their office, store, or shop, with uncleansed skin to breathe bad air all day; then at their meals they take meat, which is the most stimulating food, and condiments to stimulate appetite. These make them eat more than they need, or they have such a variety as tempts to an overloaded stomach. Then they drink tea, coffee, and perhaps alcohol, to stimulate the brain and nerves to increased action. Then they keep tobacco in the mouth, to stimulate another portion of the brain. Then they stimulate the brain with anxiety, or business cares, or study, or deep thought, all day long, without the relaxation of amusement or the refreshment of muscular exercise. And then at night they return, exhausted, to sleep again in bad air, and next day renew the same exhausting process. Thus it is *stimulate, stimulate, stimulate the brain*, from year's end to year's end, till disease interrupts or death ends the career. Or, in other cases, the man becomes a pale, delicate, infirm being, every function and every organ ministering feebly to a half-living man. Thus it is that an active, vigorous, well-formed, healthy manhood is so rarely seen in this nation.

At the same time, a vast portion of the women of our nation are pursuing a course equally abusive of the brain and nervous system. As a general rule, woman originally is organized more delicately than the other sex, having a consti-

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Questions.—What is said of the over-excitement of the nerves of thought and feeling? What class are great sufferers from this cause? What class exhaust the nervous fountain by excess of exercise? What is the course pursued by men of study by day and by night? What are the consequences? How is woman organized?

tution that can not bear either labor or long or strong mental excitement as can the more vigorous sex. Then all her physical training is less invigorating than that of man. Then her pursuits, as a wife, mother, and housekeeper, are more complicated, less systematized, and less provided with well-trained assistants than the professions of men. American women have inherited from the English nation the notions of thrift, economy, industry, system, thoroughness, and comfort, which show so strongly in contrast to the habits of the lower classes of the Irish, German, and African races. And yet all their plans and efforts must be carried out mainly by poorly-trained menials of these nations.

At the same time, the style of dress, and housekeeping, and the claims of social life also, are continually multiplying the complexity and number of domestic cares.

Thus the larger portion of wives and mothers have the numberless and perplexing *cares* of nursery, kitchen, and parlor pressing on the brain from morning to night, while unsteady servants often leave them to perform heavy drudgeries for which neither strength nor training has prepared them.

The hours in which the great majority of American mothers and housekeepers are *free from care*, and can go forth to breathe the pure air or join in social amusements, as is so common in other nations, come few and far between.

To this add all the mischief done by impure air, improper food, and neglect of the skin, which they share equally with the other sex.

But worst of all, add to these disadvantages the pernicious customs of dress, by which one half the body is subjected to extreme changes from heat to cold, while the other portion is compressed by tight girding, heated by accumulated garments, pressed downward by whalebones, and by heavy skirts resting over the most delicate organs.

Questions.—What is her physical training? What is said of her pursuits? What is said of the inherited notions of American women? What sort of servants have they? What is said of dress, housekeeping, and social life? What is said of their periods of freedom from care? What other mischief is added? What is the worst evil they suffer?

Into our rural towns, even, these pernicious customs of dress have been carried by mantua-makers from the city, and still more by the miserable fashion-plates in our literature, that set forth the distortions of deformity and disease as models of taste and fashion.

In our country towns and among the industrial classes it will be found that the taxation of care and labor on the brain of women is even worse and greater than it is in the same class of our cities. The wives of rich farmers often are ambitious to carry out plans of labor and wealth with their husbands, while, at the same time, their daughters must be sent to boarding-school, and all the habits and tastes of city life must in consequence be mingled with other cares.

In former days, when women spun and wove, and made butter and cheese, their daughters were their intelligent and well-trained assistants; and the style of dress and all the details of life were simple, and easy, and comfortable. These days have passed away.

The great majority of American women have their brain and nervous system exhausted by too much care and too much mental excitement in their daily duties; while another class, who live to be waited on and amused, are as great sufferers for want of some worthy object in life, or from excesses in seeking amusement.

Our benevolent Creator designed his creatures to learn to live *out of themselves*, and for the good of their fellow-beings, and in this course to exercise their highest and noblest powers. Those who follow this design gain worthy objects to engage and interest all their higher faculties, and thus find true happiness. But the selfish, the indolent, and pleasure-seeking, soon learn that happiness is far from the path they pursue.

But the most melancholy view of all is the course pursued in training the generation now coming on to the stage.

Questions.—How are these fashions spread abroad? How is it in country towns with women? What is said of the wives of rich farmers? What is said of mothers and daughters of former days? What is said of two classes of American women? How did our Creator design his creatures should learn to live? What is the consequence to those who follow this design? What to those who do not?

In the first place, the children of over-taxed and over-excited parents come into being with an unnatural tendency to brain and nervous affections. It is probable that the *proportion* of children who are born with a vigorous and healthy constitution is smaller, in reference to the whole number born, than at any former period.

Next, there never has been any previous generation of children who have been so extensively deprived of pure and cool air in nursery, school-room, and parlor, as those now on the stage. The air-tight stoves in bedrooms and sitting-rooms, the cooking stoves in kitchens, the close stoves in school-rooms, and the far greater care taken to make windows and doors tight, have secured this result.

Then the furnaces that are so generally used, keep the atmosphere of a house far warmer than it ever becomes with open fires. For when the body is warmed by *radiated* heat from a fire, the air never becomes so heated as when all warmth is to be gained from the surrounding atmosphere. And as the upper part of the room is always warmest, both stoves and furnaces keep the head warmer than the feet, and furnish to the lungs only a heated atmosphere to breathe.

In former days little girls took *cold* air baths all over their person whenever they went out. In these days they are covered from all cool air, and they stand over *registers* and take *hot air baths* when they feel a chill or have cold feet.

Beside this, the school-rooms are made tighter and heated hotter than they ever could be in former days. At the same time, they are crowded with occupants whose brains, while struggling with bad air, are stimulated with intellectual drills and exciting motives to exertion, such as never were known to a former generation.

It is true, that much care has been taken in many cases to ventilate school-rooms. But the methods are such as

Questions.—What is said of the children of over-taxed and over-excited parents? What is said of the proportion of children with vigorous constitutions? What has been the treatment of children in regard to pure air in this generation compared with the former? What is said of furnaces? Of radiated heat? How do stoves and furnaces affect the head and feet? What is said of air baths and registers? How are school-rooms arranged as compared with those of former days?

usually entirely fail of the object aimed at. The fact that a school demands the entrance and discharge of a hogshead of fresh air every hour *for each one* of its fifty, one hundred, or two hundred pupils, is rarely made the basis of the arrangements for ventilation. But by far the greater portion of children at schools suffer alternations of heat and cold made by poisonous and heated air at one time, diluted occasionally by currents of cold air from open doors or windows that come unequally, bearing deadly chills to the delicate pupils.

Little girls are especial sufferers in all that appertains to health. They must be housed most of the time in heated and impure air, and then when allowed to go abroad, they must wear thin slippers, and must not romp and run like the boys. And then, as they come to the most trying and critical period of life, the stimulation of brain increases, the exercise diminishes, and the monstrous fashions that bring distortion and disease are assumed.

In England, the higher classes rarely send a daughter to a boarding-school, but parents secure teachers to educate them at home, and take the greatest pains to secure a healthy and perfect physical development. But in this country, the greater portion of the wealthy classes send their daughters, at the most critical age, to be close packed in ill-ventilated chambers and school-rooms by night and by day, while all physical training is neglected, and the brain and nerves are stimulated by exclusive intellectual activity. As the result of this, twenty years ago, a distinguished medical man gave it as his opinion that a majority of school girls had more or less of the curvature of the spine. A still more terrific deformity than this is now added as the result of our miserable neglect and abuse of the young.

In multitudes of families constituting the more wealthy classes, the following is a fair account of the manner in which the brain and nerves of young girls are trained to disease, and their bodies to deformity and suffering:

First, then, their brains struggle all night with impure

Questions.—What is said of modes of ventilating school-rooms? What fact is not regarded properly? What is said of the greater part of children at schools? What of little girls? What are the different modes of teaching young girls in England and this country? What evils have followed?

blood in warmed and unventilated rooms. Then they dress with skins all polluted by the effluvia of the night, washing only the face and neck and arms. Next, they take strong tea and coffee to stimulate the brain and nerves, and then load the stomach with hot cakes, saturated with butter and sugar or molasses, or take stimulating animal food, done up in stimulating condiments. Next, they set the brain to work on school-lessons, and then proceed to the close and crowded school-room, to tax the brain for hours with bad blood and intellectual labor.

Then comes a dinner of stimulating meat, condiments, and puddings or pies. Then three hours more of brain work in bad air. Then perhaps a solemn and decent walk around a few squares, and then the rest of the time, till the bed hour, is spent in a bad atmosphere, where, a good part of the time, study again taxes the brain. The tea hour also comes in to excite the nerves with another stimulating beverage.

Meantime all that art and fashion in dress can do to distort the bones, and misplace the most delicate organs, and interrupt every health function, is every day performed.

This is no imaginary picture; it is what is going on probably in the *majority* of families of the wealthy classes all over the land, both in city and country.

The work that Providence has appointed for woman in the various details of domestic life, is just that which, *if properly apportioned*, is fitted to her peculiar organization. If all the female members of a family divided all the labors of the cook, the nurse, the laundress, and the seamstress, so that each should have four or five hours a day of alternating light and heavy work, it would exercise every muscle in the body, and at the same time interest and exercise the mind. Then the remaining time could be safely given to intellectual, social, and benevolent pursuits and enjoyments.

But no such division is made. One portion of the women have all the exercise of the *nerves of motion*, and another have all the *brain-work*, while they thus grow up defi-

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Questions.—What is the manner pursued by most young girls in their education? What is said of house-work when properly divided and arranged? What is said of two classes of American women?

cient and deformed, either intellectually or physically, or both. And so American women every year become more and more nervous, sickly, and miserable, while they are bringing into existence a feeble, delicate, or deformed offspring.

Question.—What is the consequence?

LESSON TWENTY-SECOND.

ABUSES OF DRESS. DEFORMITIES.

The chief object of dress is to protect the skin from injurious loss of animal heat. In addition to this, it promotes modesty, and is an adornment.

The most terrible evils and deformities that afflict humanity have arisen from the abuses of dress, in connection with a debilitated constitution.

The present fashion of dress, which demands that a woman's form be drawn in at the centre, like that of a wasp, and then flare out below like an umbrella, has led to horrible results.

There are exceptions to all general rules, and there may be a few cases where a woman is born with a small waist, or has induced it by tight dress, and still her internal organs seem unharmed. But as a general rule, there is a shocking and diseased state of the internal organs connected with a small and taper waist. The whole style of modern fashionable dress is a most ingenious and successful contrivance to produce the most distressing disease and deformity.

On the following page are two figures, one of which (*Fig.* 41) represents the most perfect model of a beautiful female form. The other (*Fig.* 42) represents the fashionable waist of modern days, which is secured only by deforming the bones, and displacing the most delicate and important internal organs.

Questions.—What is the chief object of dress? What is said of certain evils and deformities? What effects are produced by it? What fashion of dress is spoken of?

Fig. 41.



Outline of the Venus de Medicis.

Fig. 42.



Outline of the form of a modern belle.

Question.—What do *Figs.* 41 and 42 represent?

Here is a drawing of the skeletons of these female figures—the one as Nature designed it, and the other as Art deforms it.

Fig. 43.



The skeleton as Nature formed it.

Fig. 44.



The skeleton as deformed by Art.

Fig. 45.



The poor young girl whom the mother is dressing for a sacrifice to this horrid fashion, remorselessly girds the waist just where the bones have least internal support and yield the easiest. The small floating ribs are pressed unequally and laterally against the spine, because the intestines can not yield the equal support required. The result often is *another* distortion of this kind, called *curvature of the spine*, which injures all the internal organs. *Fig.* 45.

Questions.—What do *Figs.* 43 and 44 show? How is the deformity shown at *Fig.* 45 often produced?

Any mother can discover when this deformity is secured by examining these drawings—*Fig.* 46 showing the external appearance of the back as Nature designed it should be, and *Fig.* 47 the deformity caused by tight dress. These views are presented, because in many cases this evil, if discovered soon enough, can be remedied by methods to be hereafter indicated.

Fig. 46.



Fig. 47.



The same deformity of the spine is sometimes caused or increased by wrong positions in sleeping. If the body is placed in a perfectly horizontal position—as may be seen in the drawing at *Fig.* 48—all pressure is taken from the car-

Fig. 48.

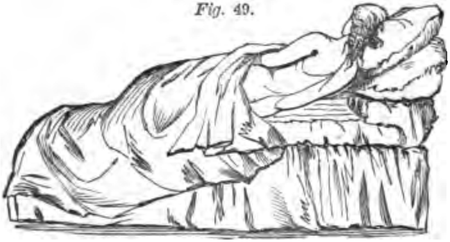


Questions.—What do *Figs.* 46 and 47 represent? How does a wrong sleeping position tend to deformity?

tilage discs of the spine, and thus, for seven or eight hours out of the twenty-four, they are enabled gradually to return to their natural form. It is found by measurement that, in this way, the spine is every night *lengthened*—these discs recovering by their elasticity a slight increase of thickness. Thus, every person is a little taller in the morning than at night.

But when a person sleeps with a high pillow, so that the spine is bent through the night, this relieving process is not allowed to certain portions of the spinal discs. (Here is a drawing, *Fig.* 49, to illustrate.) The result is, in certain

Fig. 49.



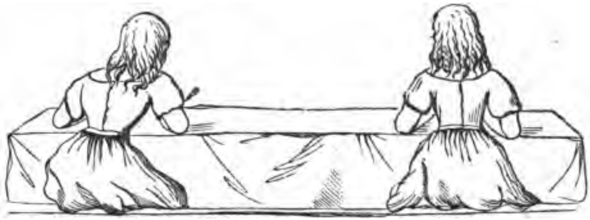
cases where delicacy of constitution particularly affects the bony portion of the body, that the spine becomes more or less distorted. This shows why it is that children should not be allowed high pillows. The pillow should be just high enough to keep the head in the natural position; and the child should be taught to sleep on both sides, if there is any danger of a departure from this ordinary practice.

Another, and still more frequent mode of distorting the spine is by the positions that children assume at school, or in study and writing at home. The drawing (*Fig.* 50 and *Fig.* 51) on the following page represents the right and the wrong methods of sitting when drawing and writing.

When children sit on high benches so that their feet can not rest on the floor, when they are obliged to sit long with the back unsupported, and when they bend over to study and read, the muscles that hold the body in its proper posi-

Questions.—What do *Figs.* 50 and 51 represent? What deformities are caused by wrong practices at school?

Fig. 50. Fig. 51.



tion become exhausted, the discs of the spine gradually harden, and various deformities—such as projecting necks, round shoulders, and crooked backs—are the result.

In childhood, and often among adults, most of these deformities can be remedied by methods to be hereafter indicated.

But the most terrible evil that a debilitated constitution and mischievous fashions in dress have induced is certain internal displacements and change of form exhibited in the next drawing, at *Fig.* 53. These are caused by the combined influence of *tight* dress, pressing the central organs downward on the lower ones, and the debility and pressure induced by the *heat* and *weight* of clothing around the hips. Observe, first, the beautiful curves of the chest and spine of the perfect form, as viewed sidewise at *Fig.* 52, and then compare it with the distorted one at *Fig.* 53.

The outline of a healthy, finely-formed child, entirely corresponds, in a side view, with this drawing of a perfect form. But most of the female forms in a drawing-room sink *inward* in front, instead of showing the beautiful *outward* curve. The effort to gain the "slender waist," which novelists and dress-makers set forth to admiration, as the Chinese do the stump foot, often produces this outward distortion, with little consciousness of the still more shocking internal results.

To understand the internal as well as external evils, it

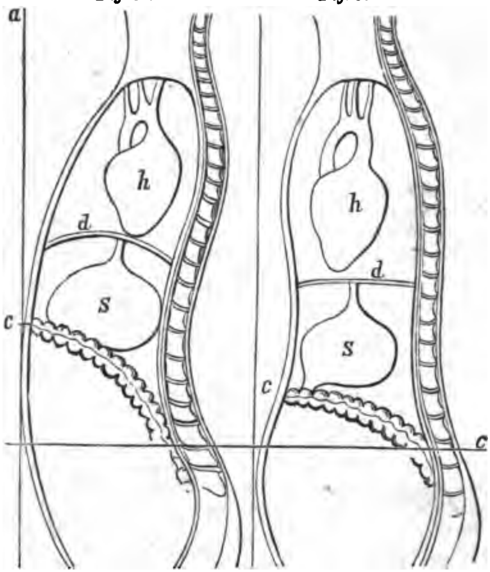
Questions.—What do *Figs.* 50 and 51 represent? What is the most terrible result of debility and mischievous fashions?

will be needful to notice in the two drawings the *packing* of the internal organs. At *Fig.* 53 is a distorted form, in which the internal organs have *sunk downward;* *h* is the heart, *d* the diaphragm, *S* the stomach.

In the *perfect* form, at *Fig.* 52, it is seen that the diaphragm curves, and the heart rests on it, while the stomach is supported by the intestines below it. Notice also the beautiful curve of the chest and spine.

In the *distorted* form it is seen that the diaphragm has sunk to a nearly straight line, so that the heart is unsupported, while the stomach has lost its support by the falling of the abdominal viscera.

Fig. 52. *Fig.* 53.



Questions.—How do you explain the results of debility and mischievous fashions as illustrated in *Figs.* 52 and 53.

Compare the two figures with both the perpendicular and the horizontal lines, and notice the difference. The distortion is caused by *debility* and *tight dresses*. The evils that result will now be indicated.

The internal organs, when closely folded and packed, must be strongly sustained both in front and below to keep them in the natural form. This sustaining power is exerted by what are called the *abdominal muscles*, which run upward, downward, and crosswise in front; their attachments being to the breast-bone, hips, pelvic bones, and spine. There are also muscles at the extreme base, within the pelvic cavity, that have a similar function.

The combined influences of bad air, bad food, excess in eating, want of exercise, and excessive stimulus of the brain and nerves, produce a general delicacy and debility of the whole organism, in which the abdominal muscles especially suffer. They lose their vigor and elasticity, become flabby and easily stretched, without power to recover their natural functions.

In this state of debility the present style of dress does every thing that can be done to deprive them of what little functional power would otherwise have remained. The result has been thousands and thousands of such distorted specimens of humanity as are exhibited in *Fig.* 53. A really perfectly formed woman, on the true model of beauty and proportion, designed by the Creator, and perpetuated in marble statues by artists, is but rarely seen among our countrywomen. Every woman who has a waist to correspond with the fashion plates, usually has her interior organs in such a shocking and disgusting situation as is here portrayed, or is fast approximating toward it.

Disorders connected with these internal Displacements.

When, as has been shown, the abdominal muscles have lost their power, the whole system of organs mainly resting on them for support can not continue in their naturally snug, compact, and rounded form, but become separated, elongated, and unsupported. The *stomach* begins to draw

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Questions.—What is said of the office of the abdominal muscles? What causes their debility? What is said of fashion plates?

from above instead of resting on the viscera beneath. This in some cases causes dull and wandering pains, a sense of pulling at the centre of the chest, and a drawing downward at the pit of the stomach. Then as the support beneath is really *gone*, there is what is often called "a feeling of *goneness*." This is sometimes relieved by food, which, so long as it remains in a solid form, helps to hold up the falling superstructure. This displacement of the stomach, liver, and spleen, interrupts their healthful functions, and dyspepsia and biliary difficulties not unfrequently are the result.

As the stomach and its appendages fall downward, the *diaphragm*, with the heart and lungs, must descend also. In this state of things, the inflation of the lungs is less and less aided by the abdominal muscles, and is confined chiefly to their upper portion. Breathing sometimes thus becomes quicker and shorter on account of the elongated or debilitated condition of the assisting organs. Consumption not unfrequently results from this cause.

The *heart* also feels the evil. "Palpitations," "flutterings," "sinking feelings," all show that, in the language of Scripture, "the heart trembleth, and is moved out of its place."

But the *lower intestines* are the greatest sufferers from this dreadful abuse of nature. Having the weight of all the unsupported organs above pressing them into unnatural and distorted positions, the passage of the food is interrupted, and inflammations, indurations, and constipation, are the frequent result, and one in which both sexes are equal sufferers. Dreadful ulcers and cancers may be traced in some instances to this cause.

Although these internal displacements are most common among women, the other sex are adopting customs of dress, in girding the central portion of the body, that tend to similar results.

But this distortion brings on woman peculiar distresses. The pressure of the whole superincumbent mass on the

Questions.—What effect is produced on the stomach by this falling of the intestines? What evils are suffered in consequence? What is the effect on the diaphragm? What is the consequence? How is the heart affected? How are the lower intestines affected? What is the consequence? What is said of customs of dress among men?

pelvic organs induces sufferings proportioned in acuteness to the extreme delicacy and sensitiveness of the parts thus crushed. And the intimate connection of these organs with the brain and whole nervous system renders injuries thus inflicted the causes of the most extreme anguish, both of body and mind. This evil is becoming so common, not only among married women, but among young girls, as is a just cause for universal alarm.

How very common these sufferings are, few but the medical profession can realize, because these are troubles that must be concealed. Many a woman is moving about in uncomplaining agony who, with any other complaint, involving equal suffering, would be on her bed surrounded by sympathizing friends.

The *terrible sufferings* that are sometimes thus induced can never be conceived of or at all appreciated from any use of language. Nothing that the public can be made to believe on this subject will ever equal the reality. Not only mature persons and mothers, but fair young girls sometimes are shut up for months and years as helpless and suffering invalids from this cause. This may be found all over the land. And there frequently is a *horrible extremity of suffering* in certain forms of this evil, which no woman of feeble constitution can ever be certain may not be her doom. Not that in all cases this extremity is involved, but none can say who will escape it.

In regard to this, if one must choose for a friend or a child, on the one hand the horrible torments inflicted by savage Indians or cruel inquisitors on their victims, or on the other, the protracted agonies that result from such deformities and displacements, sometimes the former would be a merciful exchange.

And yet this is the fate that is coming to meet the young as well as the mature in every direction. And tender parents are unconsciously leading their lovely and hapless daughters to this horrible doom.

There is no excitement of the imagination in what is here

Questions.—What is said of the peculiar sufferings to women from these displacements? What classes are found as sufferers from these evils? What is said of the horrible extremity of such sufferings?

indicated. If the facts and details *could* be presented, they would send a groan of terror and horror all over the land. For it is not one *class*, or one *section*, that is endangered. In every part of our country the evil is progressing.

And, as if these dreadful evils were not enough, there have been added methods of medical treatment at once useless, torturing to the mind, and involving great liabilities to immoralities.

These things should be presented not only to parents and teachers, but the young of both sexes should be apprised of these dangers, and taught how they may escape them.

Questions.—What is said of the extent of these dangers? Who should be apprised of these dangers?

LESSON TWENTY-THIRD.

RESULTS OF ABUSES.

In the preceding lessons have been set forth the construction of the organs of the human body; the laws of health and happiness in the use of these organs, and the abuses of them which are most common. In this lesson will be pointed out more distinctly the result of such abuses on the health and happiness of the American people.

In a review of all the abuses perpetrated on the curious and complicated organs of the body, the only wonder is that so many escape disease and death so long.

But the power of resisting evil treatment, and the power of recovery given to the human frame, although a proof of Divine mercy, have been made the occasions of still greater abuses. "Because sentence against an evil work is *not executed speedily*, therefore the heart of the sons of men is fully set to do evil."

This is the language of Holy Writ, which every day is illustrated. If, whenever men violated any law of health, they were immediately smitten with some penalty, it would prove a restraint. But because the penalties are slow, imperceptible, and often long delayed, the abuses are multiplied and continued without fear or compunction.

Every violation of every law of health probably takes away something from the *constitutional stamina* which decides the length of life, and the power of encountering diseases and accidents.

As the first result, then, of the abuses set forth should be placed the general *decay of constitution* among the whole

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Questions.—What have been set forth? What will be pointed out in this lesson? What is remarked in review of the abuses perpetrated? What merciful arrangement has occasioned greater abuses? What text of the Bible is thus illustrated? What is probably the effect of every violation of the laws of health? What is the first result of the abuses set forth?

people. This is true of both sexes, but is more strikingly seen in the state of health among American women compared with that of preceding generations. Physicians in all quarters testify that there is a delicacy of constitution, and an increase of disease, both among mature women and young girls, that is most alarming, and such as was never known in any former period.

In all sections of our country a vigorous and perfectly healthy woman is an exception to the ordinary experience. Statistics have been obtained which make it probable that, of the wives and mothers in this nation, not three out of ten can be classed as healthy women. And as the health of these mothers decides the constitution of their children, the prospects of the next generation are still more gloomy, both as it respects sons and daughters.

The great difficulty in this respect is, that no one perceives the slow and silent drain that violations of the laws of health make on the constitution. And when diseases finally occur, it is not understood that these are the results of an enfeebled constitution.

It is a knowledge of the nature of man, and of the laws of his being, which alone can remedy this difficulty.

Another result of the abuses that have been set forth, is the melancholy influences of the ill health of women on domestic happiness. When the wife and mother is suffering from the debility and pain of ill health, it not only ends her enjoyment of life, but a cloud of gloom settles over the whole family circle. The following extract from a medical writer illustrates this:

"My heart aches when I see how the mass of women, by ignorance and by blind bondage to custom and fashion, bring on themselves pangs innumerable and premature old age. Many a blooming bride at twenty, finds herself, at thirty, wrinkled and care-worn; unhappy as a

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Questions.—Where is the result of these abuses seen most strikingly? What do physicians testify? What is said of the proportion of perfectly healthy women? What is said of the prospects of the next generation? What great difficulty is mentioned? What can alone remedy this difficulty? What is another result of these abuses? What is the effect of the ill health of a wife and mother? What is said of the mass of women by a medical writer? What is said of many a blooming bride?

wife, unreasonable as a mother, and almost useless as a citizen.

"While some have inherited too much physical depravity to be preserved by any methods in good health, the majority of women have been most miserably spendthrift in using up their vital powers, thus rendering the joy of their married life as evanescent as the morning cloud.

"Many a wife who, but for her physical condition, would have been happy in her social relation, says to me, with a sigh, 'I ought never to have been married, for my life is one prolonged agony. I could endure it myself alone, but the thought that I am, from year to year, becoming the mother of those who are to partake of and perpetuate the misery that I endure, makes me so wretched that I am well-nigh distracted.'

"A wife of more than ordinary intelligence and attainments, who had, during the ten years of her married life, been suffering from these evils, asked me, after I had examined her case, if I thought it curable. I told her she could be made more comfortable, but such organic changes *could never be cured.* She burst into tears, and said, 'Oh, that I might die, then!' I asked if she was weary of life? She said, 'No, it is not on my own account, but my condition is such a trial to my husband; I wish I could give him freedom by taking rest to myself in the grave.'

"The young girl who wickedly wastes her health, and receives with an indifferent toss of the head all cautions in regard to health, little dreams of the bitter tears she will shed when it is too late for repentance to avail.

"The prospective husband may take great care to protect the fair but frail one of his choice; he may in after years fondly cherish the wife of his youth when she aches constantly and fades prematurely; still he has no helpmate—no one to double life's joys or lighten life's labors for him.

"Some sick women grow selfish, and forget that, in a

Questions.—What is said of the majority of women? What is often said by wives that are diseased? What example is given of the experience of a wife? What is said of the young girl who wastes her health? What is said of the prospective husband? What is said of some sick women?

partnership such as theirs, others suffer when they suffer. Every true husband has but half a life who has a sick wife.

"A few days since a gentleman living with his third wife, whom he had just placed under my care, said, 'There is nothing that I have so much desired as a companion *in good health;* but it is what I have seldom enjoyed in all my married life.' Then, with a sigh, he rose, and walked quickly to and fro in his spacious parlors, saying, 'My home is again shaded by sickness and sorrow, and my last hope of domestic joy is blighted.' His elegant residence and political honors could give him no enjoyment while his wife was an invalid.

"A young husband, in thriving business, of naturally a hopeful heart, presents the case of his wife, and asks, 'Can she ever be well? Will she ever have her former hopeful, loving, patient spirit?' Then the tears gathered as he said, 'We used to be happy, but now, when I come from business, she can only tell of her suffering, and reproach me because I do not try more to relieve her.' Then he added, by way of self-defense, 'I do try to nurse her, and tend baby when I can be spared from business; I get the best help I can, but nothing satisfies—*she is so nervous!*' The wife, I found, had been brought up elegantly but indolently, and so neither body nor spirit were developed sufficiently to bear healthfully the changes which maternity induces.

"There is no class of infirmities more likely to induce irritability of temper and depression of spirit than those that affect the female organization. A husband, whose wife had spent some months with us as a patient, said afterward that he should consider her stay there the best investment he ever made, even if there had been no other improvement in his wife than the change in her temper."

Nor is the suffering less when the husband and father becomes an invalid. For, besides the sufferings of his family from sympathy with him, or perhaps from the irritability of disease, which men exhibit quite as much as women, there

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Questions.—**What narrative is given of a wealthy gentleman? What incident is given of a young husband? What is said of the effect of diseases of this description on the feelings and temper? What evils attend the ill health of the father of a family?**

are the anxiety and suffering consequent on the withdrawal of the family support which a father provides. Or there is the fear of it, which often is as great an evil as the reality.

One of the saddest features of domestic evils from this cause is the suffering of young children from a feeble or diseased constitution.

A perfectly healthful infant sleeps peacefully by its mother through the night, while its waking hours seem the perfection of quiet enjoyment. But a nervous, sickly infant is a most piteous object, as its nightly as well as daily wails distress both parents, and disturb the whole family. And the effect of weakened and irritable nerves on the temper and habits of young children is most melancholy. A young girl, whose childhood had been one of gloom and irritability, and who was finally restored to health by long-protracted exercise in the open air, thus lamented to her mother:

"My whole childhood was made miserable by the state of my health. Now I am *well*, I find out that I have an amiable disposition. Before this, I always thought I had a hateful one!"

Thus parents with feeble constitutions become irritable themselves, and entailing the same evil on their offspring, the care and labor of rearing a family is increased a hundred fold.

Another sad item of domestic suffering resulting from these causes, is *the early loss of so many mothers by young children.*

There is no period in a woman's life when her constitution is so severely tried as while she is at once performing all the complicated duties of wife, mother, nurse, and housekeeper. And this is the period when death oftenest comes to end her career, while her little flock must then pass to the hands of strangers. The love and care of a tender mother can never be restored, as thousands and thousands of tearful eyes will testify.

Questions.—**What is one of the saddest features of domestic evils from this cause? What is said of healthy and sickly infants? What is said of the effect of disease on the character of children? What case is given to illustrate this? How do feeble constitutions affect both parents and children? What is another sad item resulting from these causes? When is a woman's constitution most severely tried? And what is often the result?**

It would be a sad yet interesting item, could our census present the number of men whose first, second, and even third and fourth wives are in the grave, leaving motherless children to bewail their loss.

Another evil result from the abuses set forth has been the frightful amount of *poisons* and other mischievous agents *taken as medicines*. This is set down in the preceding list of *abuses*, and also here as the *result* of such abuses, inasmuch as it is both. For medicines tend to produee diseases, and then, as a consequence, more medicines are taken.

To illustrate still farther the evils thus produced, we need to refer to the fact set forth in the lesson on abuses of the stomach, viz., that the excesses in quantity, and the wrong selections of food, keep the blood and the whole system in an overloaded state. This being so, the true remedy for the greater portion of temporary ailments would be to stop pouring into the stomach, and give nature time and strength to dispose of this excess. A fast of one, two, or three days will remedy multitudes of sicknesses; as thus all the overtasked functions of the body can rest, and the excreting organs throw off the excess.

Instead of this, some medicine is thrown into the stomach which is of the nature of a poison. Then the whole organism is instantly aroused to resist the intruder. The brain sends its nervous mandates to every part to summon aid. The blood hastens to the stomach and intestines, a general agitation ensues, while this operation destroys all appetite. Thus the blood is relieved of some of its excess, and the stomach is kept from receiving food for a day or two. This being done, the patient feels better, and the poison that made all this commotion is called the cure.

But such an operation as this never takes place without a drain on the constitution, while in many cases some portion of the poison thus thrown into the stomach is absorbed by the blood, and being carried through the body, lodges

Questions.—What would present a sad and interesting item in our census? What is another evil result? Why is the use of medicine an *abuse* and also a *result* of abuse? What is the effect of too much and bad food? What would be the true remedy for this? What is done instead? What is the effect on the body? How does such an operation affect the constitution? What other bad effect follows?

here and there in its minute and delicate tissues. This is especially the case with the metallic medicines.

Most of the popular quack medicines, advertised as cures for almost every disease, contain either calomel or quinine, or strong metallic or other poisons, that stimulate the brain or drain the blood in the way above stated. Most of them, at the same time, tend to induce costiveness by debilitating the intestinal canal. Many of them induce a tendency of blood to those parts, producing inflammations, piles, and other distressing complaints.

Every thing taken into the stomach is either food and drink that nourish the body, or it is inert, unassimilating matter that simply passes off, or it is what is more or less of the nature of poison which, whether as stimulant or sedative, produces unnatural and unhealthful action of all the parts influenced. Tonics tend to destroy tone, cathartics tend to produce constipation, emetics tend to debilitate stomach, liver, and bowels, while such medicines as mercury, arsenic, antimony, iodine, and the like, are insidious poisons that establish themselves in the delicate tissues of the body, debilitating the constitution, and generating innumerable evils. It is the wise and skillful physician alone who can use these dangerous agents properly, in the few cases where they may be needed.

The poisons that have probably done the most mischief are *calomel* and *quinine*. These are what are deemed the grand remedies for the chief diseases of our newer States, resulting from the climate, habits of diet, and the malaria of decayed vegetable matter in fresh soil.

Bilious complaints usually result from excess in eating, and a diet unsuited to a warm climate. Carbonaceous food, such as oils, butter, pork, sugar, and molasses, all tend to fill the blood with an excess of carbon. It is the office of the liver to draw off this excess. When it is overtaxed it

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Questions.—What do most quack medicines contain? What effects do they produce? What are the three classes into which we can place all articles put into the stomach? What is the *tendency* of tonics? Of cathartics? Of emetics? What metallic medicines are mentioned, and what is said of them? What two poisons have done most mischief? From what do bilious complaints usually result? What is carbonaceous food, and what is said of it? What is the office of the liver?

ceases its work. Mercury, or calomel, has the power of stimulating this organ. Instead of reducing the food, and selecting that which has least carbon, a dose of calomel is taken. This stimulates the liver to unnatural action, and it is roused from its attempt to rest and forced to double duty. Then "a cathartic" is taken to "clear out the calomel." Thus the system is for a time relieved of its excess.

But every time this is done the constitution is undermined, till finally a chronic weakness settles on the liver, stomach, or bowels. Meantime appetite fails, and the system, not so greatly taxed by food, accommodates to the weakened organs, and a sort of dying half life is the result.

In the case of chills and fever, the inhaled malaria of a bad atmosphere poisons the whole organism, and at periodic turns there is a grand effort of nature to shake it off. Quinine is a medicine that acts as a quiet, unperceived stimulant to the brain and nervous system. This being put into the stomach, acts on the brain and nerves, and gives them temporary strength, and for a time the enemy retires. In a good constitution it is sometimes the case that there is no great harm done, and the person is thus made well. But the repetition of this method often undermines the nervous system fatally. There are multitudes who, from the frequent use of quinine, have brought on deafness, vertigo, heart disease, and many nervous evils that will probably follow them through life.

In cases where biliary, stomach, and other intestinal affections are brought on by care, anxiety, or any overworking of the brain, simple diet, rest, sleep, and a great deal of exercise in the open air are better than any medicines. When these affections are caused by a chill on the skin, by excess of food, or by the wrong selection, the evil can be *starved out*. Three or four days of fasting will do it far more safely than calomel or any medicine.

Questions.—When the liver is overtaxed what is the result? What power has mercury or calomel? What is done instead of reducing the food, and choosing that which has little carbon? What is the effect of this medicine? What is the effect on the constitution? What on the general health? What is said of chills and fever, and the common treatment of them? What is the best remedy for bilious affections caused by overworking the brain and nerves? What is the true remedy when they are caused by excess of diet?

But this safe course is rarely pursued. A family medicine-chest, filled with destructive drugs, is kept on hand probably by a majority of the families of this nation, and every ailment brings forth some of these poisons to agitate and reduce the constitutional fountain. Besides this, lying quack-medicines, that promise to cure every disease, are found in the hands of millions, who blindly swallow these pernicious drugs. It is probable that on the grave-stones of half the dead in our grave-yards *Truth* would write, "Poisoned to death by medicines!"

Questions.—What is said of family and quack medicines? What might Truth probably write on half the grave-stones?

LESSON TWENTY-FOURTH.

MODES OF REMEDY.

The design of this lesson is to present the *remedies* for the evils that have been set forth in the previous lessons.

The first thing to be done is *to make the whole people of this nation properly understand this subject.*

Mankind will never obey the laws of health till they know what they are, and what are the penalties of disobedience. To secure this, they must be made to understand the construction of their bodies, the functions of the different organs, and their modes of healthful action. They must learn the nature of the air they breathe, of the fluids they drink, and of the food they eat and the influence of their habits, customs, and employments on the health of their bodies. When they do understand all this, then reason, conscience, self-love, domestic affection, and religion will all furnish motives to secure obedience to laws that are seen to be wise, and sustained by penalties that, though slow, are inevitable.

This knowledge is as necessary for children as for grown persons. They can be made to understand the construction of their own bodies, the laws of health, and the penalties of disobedience. Nothing can be made more interesting or intelligible to the young than these matters, and it is such knowledge that alone will secure an intelligent and cheerful obedience to the rules that should regulate their appetites and propensities.

Now the surest and quickest method that will extend this knowledge both to children and adults all over this nation,

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Questions.—What is the design of this lesson? What is the first thing to be done? What must men know in order to obey the laws of health? What must they understand and learn in order to secure this? What will follow when all this is understood? What is said of such knowledge for children? Can such knowledge be made interesting to them? What will it secure to them?

is the introduction of such a book as this into all our schools and seminaries. If children have a school-book of this kind in which they are interested they will take it home, the parents will read it, and thus the curious and wonderful construction of God's master-piece of wisdom, the human frame, will become a daily topic of conversation in the family. The laws of health, as studied at school, will be constantly presented by the children at home, and by this method a strong, steady, silent, unresisted influence will be brought into most of the families of the nation.

When the requisite knowledge is secured, then the changes that are to be made in the habits and practices of the people will be found to be very easy, and not at all burdensome. The following presents the principal points:

PURE AIR AND VENTILATION.

This topic takes the lead of all others in importance and difficulty. The fact that the Greeks lived most of the year out-doors, and that in their houses they never breathed any but pure air, gave them an advantage in developing the beauty, strength, and health of their children, which it is not so easy to secure with our climate and habits. And the steady and equable climate of the old countries, which has led their inhabitants to out-door life, and thus secured vigorous constitutions, gives them also a great advantage over us.

But then our difficulties *can* be met and overcome.

Every householder should be sure that every member of his family breathes pure air, not only all day but all night, by this simple arrangement: In every room of his house let at least one window be let down at the top two inches, and one door have an opening of two inches over the top. Let this be done in such a way that no person *can* alter it. For if ventilators are fixed so that they can be closed, they will be, in the majority of cases, by the ignorant, or timid, or falsely economical.

Questions.—What is the surest mode of extending a knowledge of the laws of health? What will be the effect of this in families? What is said of the changes that will follow? What is the most important topic? What advantages had the Greeks? What advantages have some old countries in regard to climate? How can every householder provide pure air for all in the house?

A house thus arranged will require more fuel to warm it, but the additional expense of this will not be a tenth part of that which would result from the loss of labor and health consequent on the debility and disease always resulting, more or less, from the habitual inhalation of impure air.

In a house thus arranged, stoves—though less healthful than open fires—would still be far less injurious than they now are.

And here one common prejudice against "night-air," resulting solely from ignorance, must be met.

It has been shown that every pair of lungs vitiates a hogshead of air every hour, by withdrawing from it one half its oxygen, and replacing it with the same quantity of carbonic acid. Now, at night, the inmates of a house must either breathe *night* air, that constantly flows in from without, and thus drives out the impure air within, or they must keep on breathing over and over again the confined *day* air of the house, that every hour grows more and more poisonous and debilitating.

The common objections to night-air are, that it is cold, or damp, or loaded with unhealthful miasmata. But if a person has bed-clothing enough to keep warm, the colder the air the better every way for all who are healthy, and often for invalids. And if the air is damp, so as to render the atmosphere of the room damp also, still no harm is done, *provided the body is kept warm.* The most delicate patients in health establishments sleep for hours with wet sheets packed around them, without the least evil or danger. A damp night-air never can harm the most delicate person if every part of the body is covered so as to be duly warm.

In regard to air taken into the lungs, there is no time when there is more water held suspended in the atmosphere

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Questions.—Why is it cheaper to use more fuel in this way? How much air is vitiated every hour by every pair of lungs? What two kinds of air does every one breathe through the night? What are the common objections to night-air? When is cold air better than warm? When will not damp air do any harm? What is said of persons in health establishments? What is said of the quantity of water in the air on a hot day?

than in a hot day. When the air becomes cold this dampness becomes sensible to the eye and feeling. But often there is really not so much water inhaled into the lungs in breathing a cold, damp air, as in breathing a warm and apparently dry atmosphere.

No reason, then, exists for excluding the night-air from the lungs when cold and damp. More clothing is required, and more care to avoid a draft on any exposed part of the body. Of course, where lungs are diseased, any extremes in temperature must be avoided.

As to unhealthful miasmata in the night-air, nothing can be worse than the exhalations of decaying bodies, as sent forth from the lungs and skin of sleepers. It is precisely the same evil as is found in proximity to grave-yards and decaying carrion. The effluvium from the lungs and skin is precisely the same as that from carrion. Those who have entered the pent-up sleeping rooms of persons who do not wash their skins or breathe a pure air, very well understand the close resemblance.

In the summer season, while vegetation is in life, the leaves of all trees and plants are *respiring*. That is, they are giving out oxygen and taking in carbonic acid by day, and then at night throwing out carbonic acid and taking in oxygen. But this respiration of vegetable nature outside of our dwellings, and all the effluvia of decaying vegetation at any period of the year, are never so effective in destroying the healthfulness of the air around our dwellings, as the lungs of the inhabitants within them.

Let it also be considered that the air we do breathe—unless the house is air-tight, which no house can be—must be *night*-air, more or less mixed with the portion which has been breathed over and over again through the day and evening. So that every body *does* breathe night-air, or, what is worse, the dry air vitiated by the breath and skin of the household.

Questions.—What is the effect of cooling the air? When is there the most water taken into the lungs? Is there any good reason for excluding night-air even when it seems damp? What precaution is required? What is said of diseased lungs? What is the most unhealthy miasma in night-air? What is it like? What is the process of respiration of leaves in summer? How does this compare with the effect of the respiration within the house? What is said of the air we breathe at night?

These things are presented in order to remove that baleful prejudice and fear that so many ignorant persons indulge toward their best friends, *air and water*.

If every person who has charge of a family make some *sure* arrangement thus to secure to every one in the house an abundance of pure air for the lungs and skin both by day and night, the grand cause that, above all others, is gradually deteriorating the vigor, health, and beauty of the American people will disappear.

Add to this, appropriate care that all the school-rooms in the land have the same arrangement made to provide pure air for the pupils. Keep the tops of the windows down both in winter and summer, and pay for the increase of fuel instead of paying the doctor and grave-digger. In every community where there are colleges and seminaries, as well as the public schools, there ought to be inspectors appointed, the same as other civil officers, to go around and see whether any parent or teacher is poisoning the rising generation with impure air. How many families, and schools, and boarding establishments would be found in which this evil, even to this hour, is perpetuated!

No parents, no guardians of the young should ever retire to rest till fully assured that every one under their care is furnished with the full supply of pure air for the night. And employers, in all kinds of business, should be taught that they are committing a great sin against the life and welfare of those they employ, if they force them to labor in impure air.

Every minister of the gospel should take care that his own spiritual concerns, and those of his hearers are not checked and interrupted by bad air; and he should teach his people their obligations in this matter, both to themselves and to all under their care. The physician, too, is especially bound to use his influence in the same direction.

Questions.—Why are these things presented? How would the chief cause of ill health in this nation be remedied? What should be done for schools? What health officers are needed? What should be done by all parents, teachers, and employers? What should be done by ministers?

EXERCISE AND AMUSEMENT.

Next to pure air, *healthful exercise and amusements* are the most important remedies for the evils set forth.

The modes for securing these are not so easily indicated. A great part of the American people exercise certain portions of their muscular system too much, while their intellect has little activity, and their spirits are rarely cheered and animated by amusements. Another portion keep their brain in constant labor, without the balancing influence of muscular activity, or the relief of recreation. And still another portion give up their whole being to pleasure-seeking and amusement, without any useful activity either of body or mind.

There are various measures which might be adopted, that each in its place would tend to a better adjustment of this difficult matter. To give an example of what *might* be done, let it be imagined that, for the sake of an experiment, funds were provided, and the inhabitants of a community should all agree to give the method here suggested a fair trial.

In the first place, a course of lectures should be given, for the purpose of making the people fully understand the evils to be remedied, and the benefits to be secured.

Next, a central site should be provided, on which should be erected a large and beautiful building—a *Temple of Health.* Around it should be every variety of pleasant walks, and shades, and flowers, to attract and please in the summer months, and other arrangements provided for out-door sports and exercises in winter. Within the building should be arranged a great variety of apparatus and accommodations for in-door amusements that *exercise the muscles,* and those which in most cases could be performed *in measures and to the sound of music.* These exercises should be under the direction of scientific and medical men, and no one should be admitted to these premises except on condi-

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Questions.—What next to pure air are important remedies? What is said of a great part of the American people? What of two other portions? In the example given of what might be done, what is the first measure? What the next? Who should direct the exercises?

tion that he would strictly obey the direction of these managers.

All persons attending should then be examined in regard to their daily avocations, their diet, the ventilation of their sleeping and business rooms, the defects of their physical system, and any disease they may suffer, and advice appropriate be given. Then a course of exercise, fitted to each case, should be marked out, and superintendents appointed to see that all these directions are obeyed. The aim should be, not only to secure exercise, but that kind which is appropriate to each case, and also that which would prove *exhilarating* and *amusing*. For exercise that is sought as a pleasure is more than doubled in value.

In short, every arrangement should be made in strict conformity to the laws of health, and all excesses should be excluded. Here, too, parents should be instructed in family plays and games, and thus induced to join with their children in home amusements. For nothing so binds the young to those who control them, as aid and sympathy in amusing sports.

It is probable that if any community would once fairly test such a plan as this for six months, nine-tenths of the diseases, infirmities, low spirits, and ill-temper of that place would vanish away, while every social, domestic, and religious virtue would take a new start.

The preceding method is suggested mainly with reference to adults. In regard to the young, the grand remedy must be in connection with schools and other institutions for education.

As these are now conducted, all the money, time, and efforts are spent in training and exercising the intellect. In our higher institutions, one department is *endowed* that a teacher may give all his time and efforts to cultivating the mathematical faculties. Another endowment supports a teacher to train the linguistic powers. Another endowment secures a teacher for chemistry—another provides for some

Questions.—What method should be pursued by all who attend? What is said of the value of exercise that is amusing? In what should parents be instructed, and what would be the benefit? What would be the probable result of such a method? What would be the grand remedy for the young? What is said of the expense for training the intellect?

other of the natural sciences. Thus, there is a constantly accumulating outlay for divisions and subdivisions of labor, and all for the intellectual department of education. Stringent rules also are made, and laws enforced to secure obedience to arrangements that often involve most flagrant violations of the laws of health.

But not in the wide circuit of our nation is an institution where even *one* teacher is sustained whose official duty it is to secure the health and perfect development of that wonderful and curious organism on which the mind is so dependent. The students in our colleges and other institutions of learning should be required to breathe pure air; to exercise their muscles appropriately and sufficiently; to retire as well as to rise at proper hours; to take care of the skin, and to avoid the use of stimulating herbs and drinks; and the same watch and care should enforce these duties as are now devoted to training the intellect. And endowments should be provided to sustain well qualified and able men, whose official duty it should be to give instructions, and exercise the supervision that would secure so important a result.

In regard to all our common and other schools for young children, to the proper ventilation of their school-rooms should be added a complete and scientific training of their bodies to perfect health and the full development of every part. This is entirely practicable, and would be immediately adopted by every teacher did the public demand it. One half hour of every school session ought to be spent by every teacher and pupil in a regular course of calisthenic and gymnastic exercises, that should be as imperative as any other school duty.

A universal course of training of this kind, scientifically arranged and applied, in connection with obedience to other laws of health, might, in one generation, transform the inhabitants of this land from the low development now so extensive to the beautiful model of the highest form of humanity.

Questions.—What is said of the neglect of physical training? For what should able men be employed, and endowments provided? What should be done in common schools? What would be the result?

LESSON TWENTY-FIFTH.

MODES OF REMEDY.

NEXT in importance to air and exercise comes the selection of diet and drink. And in this matter the practical adoption of one common-sense maxim would do almost all that needs to be done. The maxim is this: *In cases where one of two courses involves danger and risk and another is perfectly safe, always choose the path of safety.*

We have seen that the great mass of this nation is fast hastening to disease and deterioration, and that individual misery and domestic unhappiness are widely increasing as the result. We have seen that owing to needless varieties, to stimulating food and drinks, and to the use of condiments, *excess* in loading the digestive organs is one great cause of this extensive suffering.

Now there is a rich variety and abundance of simple, healthful food and drinks that are fitted for the perfect development and nutrition of the body, and involve little liability to perversion and excess. And when all stimulating food, drinks, and condiments are relinquished, and a simple diet maintained, a *healthful appetite* returns, which is a safe guide to the proper amount to be taken, provided always that enough pure air and exercise are secured.

After living for several months on simple food, there is an increased susceptibility of taste and a keener relish for the delicate flavors that such food offers. Does any one remember the delicious relish of childhood for a bit of good bread? This same relish will again return when solicited aright. Let a person for several weeks try the experiment

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Questions.—What comes next in importance to air and exercise? What important maxim in regard to food and drink? What is said of excess in eating?

of drinking only water, eating nothing but bread and butter, very little meat, potatoes, baked fruit, and milk, and at the same time exercise abundantly in the fresh air, and he will say, "Never did food of the richest variety and composition furnish such an exquisite relish!"

The more a person will limit a meal to *a few articles*, and these of the *simplest kind*, the more will he regain the appetite and relish of early life.

Now the course here suggested is perfectly safe, is equally productive of enjoyment, and is in obedience to the laws of health, which are the laws of God. The common course pursued in this land of abundance and gormandizing is certainly one of risk and danger to the delicate and deteriorated constitutions of the adult and rising generations. Here, then, is the place to practice the Christian "daily" duty of "self-denial." And if the strong and healthy feel no need of it for themselves, a duty is set forth for them in this inspired command, "We that are strong ought to bear the infirmities of the weak, and not to please ourselves." Parents and all who have charge of the young ought to set them an example of simple diet and few dishes.

In reference to stimulating drinks the need of this divine injunction is extreme. The parents of a family drink tea and coffee. They teach their children perhaps that it is a dangerous and unhealthy practice, and train them to entire abstinence. But after a few years these children draw to manhood and womanhood, and begin to claim the privileges of acting by their own judgment. Then, after a period of deprecation and remonstrance, the luxury is conceded. Some one of the flock is feeble, the strong can bear it but the weak one falters. No eye but that of the Heavenly Parent marks how this one single cause is daily draining the already stinted nervous fountain. And when the flower is cut down, the weeping parents mourn over the sacrifice offered by themselves to their own self-indulgence by their neglect of that beneficent law, "We that are strong

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Questions.—How can a healthy appetite be restored? What text of Scripture should guide on this subject? What is needed in reference to stimulating drinks?

ought to bear the infirmities of the weak, and not to please ourselves."

Oh, that tender parents, who provide these dangerous beverages, would look around the beloved circle and see which one they can select as the hapless victim!

And so in reference to that disgusting and baleful use of tobacco, which all over the nation is draining the nervous fountain of thousands of pale and delicate young men. This weed is rank poison. After taking it a while, a craving appetite for it is created, and men and boys chew it, smoke it, and snuff it, till thousands and tens of thousands perish from its poisonous influence.

This weed is cultivated all over the land. What is used costs this nation *thirty millions* of dollars. This is more than all that is spent for education or religion. And yet the effect is to exhaust the nervous system, to destroy the tone of the stomach, to create a thirst for intoxicating drinks, to irritate the temper, stupefy the sensibilities, defile the house, and offend the neat and refined, while it does no good to any living being. It is probable that tobacco destroys more than alcohol, because so many more use it, and so many are led to opium and alcohol by its influence. And yet the clergyman, the church elder, the father of the family, indulge in a useless and dangerous practice, merely to gratify a morbid appetite. While they teach others to "deny fleshly lusts," and upbraid the young if they fall, in their own cherished fleshly appetite they see no sin.

But every young victim to this appetite who has been led on by their example, or has not been withheld when their arguments and example might have saved them, is set down to their account by Him who seeth not as man seeth. He whose example of self-denying benevolence they profess to follow, whose last teachings on earth were, "If ye love me feed my sheep; feed my lambs"—He has left to them, above all others, the sacred monition, "We that are strong

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Questions.—What is said of the use of tobacco and its effects on the health of young men? What effects are produced by taking it a while? What is the cost of tobacco? What is the evil done by it? Does it do any good to any one? Why does it probably destroy more than alcohol? Who often set a bad example, and what is said of them?

ought to bear the infirmities of the weak, and not to please ourselves."

In this nation no one can travel without being constantly made to feel what a *selfish* as well as disgusting and ungallant habit is induced by the use of tobacco! The majority of ladies are offended by the effluvium of that weed, and disgusted by its marks on the mouth and face, while the puddles of tobacco juice that infest our public conveyances, the breath of smokers, and the wads and squirting of chewers, not only defile the dress but keep a sensitive stomach in constant excitement and agitation. If those who practice this vice will insist on perfuming public conveyances with dead tobacco smoke from their dress and lungs, and rendering all their premises filthy and disgusting with their expectorations, the managers of these conveyances should be required to provide rooms and cars for ladies and all other persons who are annoyed by this vice, from which all who either smoke or chew shall be excluded.

A great change in the habits of this nation is required in regard to the use of *carbonaceous* food, the chief articles of this class being butter, fats, sugar, and molasses.

Owing to cheapness and abundance, the enormous quantities of these articles that are allowed to young children are such as never was known in any former period of our own history, and such as is never witnessed in any other country.

The wear and tear on the constitution, in the labors of the various organs to throw off this excess, must be a constantly exhausting drain. This is especially the case when they are allowed in the form of confectionery, which, in addition to its other evils, imposes on the stomach the extra tax of digesting highly concentrated food and at irregular periods.

Our custom of taking food in such a hurried manner, without proper time for mastication, or for the stomach to perform its duties, must be changed.

Questions.—What is said of the use of tobacco in reference to ladies? What is said of carbonaceous food? What are the chief articles of this class? What is said of their use by children? What is the result? What is said of confectionery? What custom should be changed?

The assembling of a family at their meals should be made a period of easy relaxation and social enjoyment. Every thing should conspire to render the occasion one in which the social and intellectual should so predominate that the gratification of the humbler appetites may become subordinate.

Question.—What should be done at meals?

LESSON TWENTY-SIXTH.

MODES OF REMEDY.

Next to air, exercise, and diet, the care of that complicated and sensitive organ *the skin* is to be regarded.

It has been shown that the full circulation of blood in the capillaries of the skin, and the free discharge of its secretions, are the objects to be aimed at in promoting perfect health. For this purpose air, light, water, friction, and cold are the chief agencies, and are also healthful tonics to the nervous system generally, from its intimate connection with the skin.

All these agencies are secured by a daily morning ablution of the whole person. In order to this, no extensive bathing apparatus is required. A screen, made like a small clothes-frame, to set around a wash-stand, a bowl of cold water, and two towels, are all that are needed.

The quickest way to bathe is, with one towel, dipped in water, to wet first the upper and then the lower portions of the body, and then to rub them till dry and red with the other towel, which should be a rough and coarse one.

This followed by drinking a tumbler of cold water and a walk in the cool morning air, or, when the weather forbids, a series of *calisthenic* exercises before an open window, will give a healthful glow and appetite.

As to dress, it should always be sufficient in thickness and warmth to prevent any sense of uncomfortable chilliness. This being secured, the less clothing the better for the skin and the whole body.

Heat is always debilitating to the skin, while cold and pure air are tonics. But all changes in this particular must

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Questions.—What comes next in importance after air, exercise, and diet? What is needful for the perfect health of the skin? What should be the mode of bathing every morning? What should follow it? What direction in regard to dress? What is the effect of heat on the skin, and what of cold?

be gradual, and great care must be taken not to exceed the nervous supply of the system, by abstracting animal heat too often and too long.

A great many persons lose all the benefits of water-treatment, and others bring on disease, by bathing in too cold water, or by bathing too often or too long. There are some cautions needed on this subject that will be given in a following lesson.

In regard to the present fashion of dress three changes are indispensable to health.

The first is, that it should always be so *loose* as to allow the *fullest* inspiration of the lungs without restraint, and never to press at all on the middle and lower portion of the body.

The second is, that all the weight of the clothing should be supported by the shoulders, and never allowed to rest on the hips.

Lastly, the upper part of the body must be clothed more, and the lower portion relieved of the enormous accumulation. In order to secure this last the drawings on the following page are given:

Fig. 54 is a pattern of an under skirt designed to keep the body *equally* warm in all parts. The plaits, or gathers, are shown at the lower line, and are to be below the hips.

Fig. 55 shows a method of making a skirt that shall stand out from the body, and yet give the same appearance as is made by many skirts. The skirt is made of two parts. The upper one is a double strip, with slides in it, which is drawn up on whalebones to the right form. Then the lower portion is gathered on to this. The whole is to be *buttoned* on to the waist.

This skirt is cool in summer, while in winter all needed additions can be worn under it.

CUSTOMS OF SOCIAL LIFE.

There are also great changes to be made in the customs of social life. The American people claim to be in advance

Questions.—What caution in regard to changes? What direction in regard to the fashion of dress? What three changes in the fashion of dress should be effected? Describe the drawings of *Figs.* 54, 55? What is claimed by the American people?

Fig. 54.

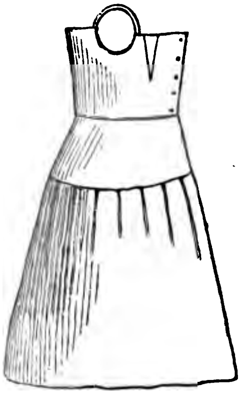


Fig. 55.



of all other nations in civil and religious liberty. They are complimented as the people who are to take the lead in guiding all others to the most perfect state of social, civil, and moral development.

If this honorable career is before them, it surely is inconsistent with their high vocation to become slaves to injurious customs that are manufactured for them abroad. Why should not the American people originate customs in social life as much in advance of old nations as are their civil concerns?

We have seen that *light* is more favorable to health and perfect development than darkness. We have seen that even the trees and shrubs exhale their life-inspiring oxygen by day and their carbon through the night. This teaches mankind that the time for the quick circulation of muscular labor and brain excitement is *the day*, while the slow breath of slumber is reserved for the less healthful atmosphere of night.

Questions.—What is inconsistent with this claim? What is said of light and its effects on the vegetable world? What does this teach?

Now those countries whose customs are founded on the assumption that one class of people are to do the work, and another class are to appropriate the best fruits of this labor, have instituted social customs on the plan of making every possible barrier of separation between these two classes. And so the aristocracy sit up all night and sleep by day, while those who carry on the business of the world are abroad in the light and slumber in the hours appointed by God for sleep.

But it is the pride of our nation that all men are equal in rights and privileges, and that no aristocracy can flourish here. Why, then, should we not banish those customs of social life that are low imitations of what is false and wrong? Why should not the American people set an example to the Old World of customs conformed at once to the laws of health, the laws of God, and the spirit of their own boasted institutions?

In the palmy days of our early Republic, all classes rose with the sun, and all the hours of labor, even for the highest, were by daylight. And their social gatherings were ordinarily ended when the "nine o'clock bell" gave warning that all well-ordered families should retire to rest.

In another matter we have an opportunity to excel even the fathers of our Republic. The farther man advances from childhood and in social life from the savage state, the more do refined and intellectual pleasures take the place of merely animal. In the lower states of society the chief attractions to social gatherings were *eating and drinking.* But just in proportion as man becomes elevated, this lowest species of enjoyment gives place to higher and more refined pleasure.

May we not hope that our country is so far advanced as to be able to institute new customs in these respects?

It certainly is true that the great body of cultivated and sensible people in this country heartily despise and condemn the vulgar gatherings where a good part of the night is spent

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Questions.—What customs prevail in aristocratic countries? Why are such customs inconsistent with the character of our country? What is said of the palmy days of our nation? What is said of eating and drinking at social gathering.

in unhealthful air, unhealthful dresses, stupid recognitions, and unseasonable eating and drinking. Why should this sensible portion be controlled by the uncultivated and frivolous?

It is hoped that the time is not far distant when all well-educated and conscientious people will regulate the hours for social gatherings, and the entertainments provided by the laws of health and reason.

HEALTH ESTABLISHMENTS.

A very prominent mode of remedy for ill health already induced, is a resort to properly conducted *health establishments.*

The most valuable of these are those in which cold water is applied scientifically as a medicinal agent. The following account of the operation of cold water, when applied internally and on the skin, contains important information:

Cold water taken internally operates first to dissolve and thin the morbid accumulations in all parts of the system, and thus prepare them for ejection through the skin, lungs, kidneys, and bowels. Next it tends to equalize the circulation by thinning and removing these morbid obstructions, so that the blood can flow equally in every part. Next it stimulates the capillaries to quicker action all over the body. Water taken into the stomach is drawn into the circulation in ten or fifteen minutes, and as the great mass of the blood courses through the body six or eight times every hour, it is seen that the water in that time may visit nearly every part. If more is taken than the body needs, the kidneys draw it off and send it out.

Cold water is also a *tonic;* that is, it operates to give stronger action to the minute capillaries, and this, like the exercise of the muscles, gives increase of vigor. Thus, cold water taken internally operates to purify the blood, to equalize the circulation, and to strengthen the capillary action by increased exercise.

Questions.—What hope is expressed? What is a prominent mode of remedy for ill health? How does cold water operate internally? How does it effect the circulation? How does it effect the capillaries? What is said of the absorption of water from the stomach? If there is too much taken, what is done? How does cold water operate as a tonic?

Cold water applied *externally*, in baths, operates in several ways. In the first place, it is a tonic to the nerves and capillaries of the skin. And as there is more nerve matter and more blood in the skin than in all the other capillaries of the body, there is no mode of applying tonic remedies so potent and so readily within reach.

Next, cold water can be applied in *local baths* to draw the blood from one portion of the body where there is an excess, to another part where there is a deficiency and consequent debility. The sitting and foot baths are of this nature. If we need blood and increased action in any particular part, *cold* is applied by water. The capillaries contract and send their blood inward, reporting to the brain the need of the part. Instantly there is a return of a greater supply than before. This process can be continued till a habit is induced, and thus the part is strengthened.

Next, cold water, in drawing off heat from the body, and quickening the action of the capillaries, hastens the process of *change* which is going on all over the system in sending off old, decayed matter, and replacing it with new material furnished by the lungs and stomach. It is thus that the Water Cure quickens the appetite to supply the increased demand.

Lastly, cold water can be applied as a kind of *poultice to the skin*. In this case, the *moisture* and *warmth* draw the blood to the capillaries of the skin, and at the same time stimulate the lymphatic absorbents to quicker action. By this method morbid humors are drawn from the internal organs to the skin, and thence are thrown off. The wet sheet is a cold-water poultice for the whole body. The wet bandages, worn over diseased parts, are smaller poultices. Both act to draw blood from within to the skin, and then to abstract from it the morbid humors.

When we consider that the surface of skin comprises fifteen square feet, and that this surface is made up of millions of perspiration tubes, oil-secreting glands, and sensitive, nerv-

Questions.—How does cold water operate on the skin? What is said of local baths? What is the mode of action when such baths are taken? What is the operation of water in drawing off heat? What is its operation as a poultice on the skin? What does the surface of the skin comprise?

ous reticulations, we perceive a method of influencing the brain and nerves, and, indeed, the whole system, such as can be secured in no other way. We can depress one part, and stimulate another; bring the blood to the surface, drive it inward, equalize and cleanse it, and apply a universal tonic to its whole net-work of nerves by means of this one simple, pure, and universal element.

But the medical and scientific application of cold water for the cure of disease is only one of the benefits to be obtained in these health establishments. The great thing secured is a rational, intelligent *obedience to the laws of health.*

The use of cold water tends to dissolve and carry off, by quickened action, all the component parts of the body. During this process it should be renewed with pure and healthful materials by a simple diet. Tea, coffee, alcoholic drinks, opium, tobacco, spices, and condiments of all sorts are to be relinquished. Fruits, vegetables, broths, one kind of meat, good bread and butter, and a great variety of simples, such as cracked wheat, hominy, and the like, are provided, and the patient must eat these or go somewhere else for food.

Next, after every bath the patient is required to bring on a glow by exercise in the open air, and as baths are taken four and five times a day, this secures a considerable amount of pure air for the lungs, as well as exercise for the lower limbs.

Besides this, the patients are withdrawn from all their business and cares. The brain has a chance to rest; while the baths and walking furnish occupation that is cheered by the stimulus of hope. At the same time, in these gatherings, every person finds one or more sympathizing associate in walks and sports, and thus time never seems to hang heavily.

In some institutions, also, such arrangements for *ventilation* are *enforced* as secure to the patients *pure air* both by night and by day. In others this is neglected.

By means of the books treating on health and the Water Cure, which abound at such places, by means of lectures from the physicians, and by the discussions on these topics

Questions.—What method does this give? What can thus be done by cold water? What is the great thing secured in health establishments?

among the patients themselves, there comes to be an intelligent conviction of the reality and obligations of the laws of health, which is carried to multitudes of homes to modify and improve the habits of a household. At the same time, the various simple articles of diet, and healthful modes of cooking are learned, and transferred to home-circles.

In addition to all this, at certain health establishments the system of calisthenic exercises in this work has been introduced with wonderful results. Not only has the recovery from disease been greatly facilitated, but many deformities of person have been entirely rectified by these methods. In many cases known to the author, curved spines, crooked backs, projecting necks, round shoulders, and sunken chests, have been entirely removed. It is often the case that these exercises will enlarge the thorax, and thus expand the lungs, to the extent of three, four, and even five and six inches.

Although this mode of treatment is very expensive, and usually requires months, and in bad cases years to complete, yet such has been the success of these methods that every year increases the patronage of these institutions.

And yet a great deal of mischief has been done by *excesses* in this mode of treating disease. These have resulted, in the first place, from the fact that the system originated among the hardy, phlegmatic German race, and needed modifications, to adapt it to the excitable, sensitive, and worn-out constitutions of the American people, that could only be discovered by experiment. During the ten years of its trial in this country it has constantly gained in successful results, and almost as constantly diminished in the energy of its application.

The excesses referred to relate to *exercise* as well as to the application of water. Every human body has its reservoir of nervous energy, some large, and some very small, with all grades between. Now the grand difficulty in the

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Questions.—What is said of calisthenics in health establishments? What shows the success of this mode of remedy? Has mischief been done by these modes? Where did this use of cold water originate, and what resulted from it? What is said of excesses in exercise?

management both of water and exercise, as remedial, is that both physicians and patients are insidiously led on by the feeling that "more produces more," without any need of careful and scientific limitations.

There is nothing that requires more careful watching and good judgment, than to adapt the amount of water-treatment and exercise to the degree of nervous resource which each patient may possess. And, probably, more than half the benefits of both methods have been lost by such excesses that the nervous fountain had only enough of supply for the excessive tax put upon it by the treatment, and had little to spare for the struggle that otherwise would have thrown off the disease.

This evil comes sometimes in spite of the care and caution of the physician, but more frequently for the want of it. The fact that the chief difficulty is to bring patients to exercise enough, leads to measures and motives that stimulate a certain class that need rather to be held back. At the same time, there arises a spirit of emulation, and a pride and self-gratulation at achievements which strongly tempt to excess.

There are often cases, also, when persons attempt to treat themselves with water without the aid of a physician, and thus increase their diseases. The wrong use of the shower-bath has been often a source of mischief. It is especially injurious to nervous and excitable persons and to children. None of the processes of water treatment should be continued when discomfort or any evils follow.

Question.—What occasions difficulty in respect to exercise?

CALISTHENIC EXERCISES,

FOR

SCHOOLS, FAMILIES, AND HEALTH ESTABLISHMENTS.

SELECTED AND ARRANGED FROM VARIOUS SOURCES.

BY

CATHARINE E. BEECHER.

NEW YORK:
HARPER & BROTHERS, PUBLISHERS,
FRANKLIN SQUARE.
1856.

INTRODUCTION.

ENCOURAGEMENT TO ADOPT THIS COURSE OF PHYSICAL TRAINING IN SCHOOLS.

The author wishes it were possible to present all that she has learned or observed that would prove the benefits of the method here set forth. But only a few hints can be attempted.

First, then, all allow that *exercise in pure air* promotes health and the perfect development of the body.

Next, in all those countries where physical training has been made a part of school culture, there has been such improvement of health, strength, and beauty, as fully to establish the value of such a course.

Next, it is generally conceded that the children and youth of this country, during the period of school, college, and professional education, have *relatively* too much stimulus of the brain and nerves, and too little training of the physical system.

Next, experience in our schools and colleges proves, that unless such training is made *imperative as a school duty*, it will be neglected; especially by those who need it the most. For the more the body is enervated, the more does exercise become irksome.

Next, the author has known cures performed in health establishments and elsewhere, by means of these exercises, in connection with a strict enforcement of the laws of health, very much greater than any thing she has ever known effected by *any* method of medical treatment. Headaches, dyspepsia, all varieties of nervous diseases, lung and liver complaints, local diseases and weakness, and a great variety of deformities, have been remedied by this method. Great changes also have been made by these exercises in the size,

figure, and graceful carriage, not only of the young, but of men and women, and some of them over forty years of age.

The following testimony from medical writers is abridged from an introduction to a work containing the system of *Ling*, the author of the celebrated Swedish course of Gymnastics and Calisthenics.

Were these exercises made an *indispensable* part of *school* as well as family education, many diseases consequent on constitutional debility, or neglect, or abuse, would be prevented. And thus, *through our free schools, the number of the infirm and ailing poor would be diminished.*

The art of *preventing* disease is surely superior to the art of curing it. Galen, the celebrated ancient physician, declared him to be the best physician who was the best teacher of gymnastics.

Gymnastics not only give fullness and strength to the muscles, but they increase force, flexibility, and dexterity of movement, and thus contribute to grace of person and skill in the use of the hands and other limbs.

Gymnastics, by opening the chest, and increasing the size and action of the lungs, give a tone and vigor to the whole organism. Debility, scrofula, rickets, and various deformities can thus be remedied.

Obesity, or an excess of fat, is almost certainly removed by such exercises. So a weak digestion, diseases of the liver, tendencies to dropsy, are all remedied by the increased activity of the muscles, and the consequent increased power of digestion.

Gymnastics, by increasing the circulation of the blood in the skin, renders its complicated system more active in carrying off the seeds of disease, while its nerves become less impressible to heat and cold, and other changes in the atmosphere.

Gymnastics, as above remarked, have a most direct influence on the organs of digestion. The equilibrium between food and waste is re-established, sleep becomes regular, the senses are sharpened, and all the faculties invigorated.

In the commencement of consumption, in piles, and in

other abdominal diseases, the gymnastic exercises are important means of cure. So in nervous debility, hysterics, and the evils of too early puberty.

It is known that scofula often disappears with the use of gymnastics. Franke, the physician, says, "We daily see many children with large stomachs, and constipation of the intestines, cured as soon as they begin to walk and run about in the open air."

Galen says, "If diseases take hold of particular parts of the body, there is nothing more sure to drive them out than diligent exercise." Herodicus, a celebrated ancient teacher, cured himself and many others of disease by gymnastics. Galen, who, at thirty, was weak, became strong and healthy by devoting several hours a day to gymnastics.

Several other ancient wise men, with Lord Bacon among moderns, are quoted as declaring gymnastics to be almost a universal medicine; "because there is no disease whose further development could not be prevented, or which at its commencement could not have been cured by bodily exercise."

But the effect of gymnastics on the body is not their chief benefit. Says Montaign, "It is the soul, and not the body alone, which we educate, and we must not train the one without the other."

Plato, that wisest of the ancient philosphers, says, "Excess of bodily exercise may render us wild and unmanageable, but excess of arts, science, and music makes us faddled and effeminate. Only the *right combination* makes the soul wise and manly." The great Hufeland advises that children, till the seventh year, spend most of their time in bodily exercises in the open air.

"If young children are compelled to sit quietly in a room, and their young minds urged to action, we *take from them the noblest part of their strength, and consume it in the function of thinking.* Thus growth is retarded, the limbs imperfectly developed, the muscles weakened, the digestion becomes bad, scrofula perhaps appears, and then ensues a great predominance of the nervous system. Any *unequal* development of our faculties is injurious, and it is certain that mental exertions weaken the more they are unaccom-

panied by bodily movements. It is also certain that those who, *between their mental occupations, go through suitable bodily exercises, can work mentally much more than those who neglect this exercise of their bodily powers.*

"Gymnastics act on the courage, and produce independence and presence of mind. No man can possess much courage whose chest is narrow, and whose lungs are not fully developed.

"Gymnastics produce cheerfulness and regulate fancy and imagination. They also diminish a predisposition to moral faults that undermine health and bodily purity."

Gymnastics strengthen the intellectual faculties. Says a distinguished writer: "If you wish to develop the mind of a pupil, exercise his body; make him healthy and strong that you may make him prudent and reasonable."

Exercise assists the intellect by a suitable interruption to mental labor. Uninterrupted mental exertion makes the mind heavy and dull, and gives it a false direction.

The invigoration of the body by exercise diminishes the craving of the taste for sensual pleasures. Rousseau says, "All sensual passions are found in effeminate bodies, while the more they are roused the less they are satisfied. A weak body weakens also the mind."

A generous regard for the common good, and a willingness to make sacrifices for it, are most readily developed in a strong and healthy body. It is the feeble and sickly who are dwelling with morbid solicitude on themselves and their ailments.

"The feelings of friendship and all the generous sympathies are promoted by gymnastics practiced in concert with others, as also is a love of order and precision, and a habit of obedience."

Says the great Hufeland, "Give a child sufficient muscular motion, so that the store of nervous strength may be turned to the muscles of volition. Let a child exercise daily and often in pure air, *till fatigue follows*, and I am sure he will not think of vicious practices. These are the attendants of sedentary education in boarding-schools and other monastic establishments, where exercise is measured only by half hours."

CONTENTS.

CALISTHENIC EXERCISES.

CALISTHENICS FOR THE SCHOOL, FAMILY, AND HEALTH ESTABLISHMENTS.

FIRST COURSE—SCHOOL-ROOM EXERCISES.

In the first place, let the teacher appoint *stations* for every pupil, and arrange the divisions and sections with their leaders. (See p. 39 and 40.)

Next give a lesson to the leaders of sections, that they may aid in superintending their several sections. This arrangement should always be made, even when there is no separate room for exercise. A common school-room may be marked off into stations for partners and sections.

The method should be to go over the first fifty exercises, performing each movement only *once*, so as to learn the method. The next time all should be performed *twice* each, and done moderately. Then let one be added each day to the number, till the whole is completed as directed in the book. Each day let the quickness and force be increased, till they are done as forcibly and quickly as possible, except those that are directed to be slow movements, and these are to be done with all the *force* possible.

The teacher should caution the pupils that are delicate not to attempt these exercises alone; and if in any case certain movements cause unpleasant feelings, to omit them until more strength is gained.

The pupils should dress *loosely*, and all their clothing be suspended from the shoulders and not rest on the hips at all. Pure and cool air is indispensable.

Sometimes it is the case that certain diseases render certain exercises inexpedient. In the case of any delicate pu-

pils, who are unfavorably affected by any of these exercises, the teacher should seek medical advice.

The teacher should select those who have any personal defects—such as projecting necks, round shoulders, crooked backs, toes turned inward, etc.—and direct them to additional exercises, to be performed out of school, for the cure of such defects.

EXERCISES FOR THE CHEST AND LUNGS.

Exercise 1.

Let all the pupils take a given station, and at such distances that they can throw out their arms without touching each other. Then let the teacher give words of command as here indicated.

Word of Command—"Military Position!"

The directions here given are the same as those used by drill-sergeants in training military men, and therefore it is called the *Military Position.*

Fig. 1.



Let the heels be half an inch apart, and the feet turned out so as to form *an angle of sixty degrees.*

Let the knees be straight.

Let the shoulders be thrown back, the arms hang close to the body, the hands open to the front, the elbows turned in and close to the sides.

Let the chest be advanced, and the lower part of the body drawn back.

Let the head be erect, and the weight of the body be thrown onto the front part of the feet, as in *Fig.* 1.

This position brings the ear, shoulder, hip, knee, and ankle into a line, as is illustrated in this figure.

The three next exercises have a powerful influence on the chest and lungs. The health and lives of many young children are endangered by *too quick growth.* This is owing often to the fact that the chest and lungs are not sufficiently developed. The weakness that attends quick growth indisposes to energetic muscular action, and this, with the contracted chest, often brings on consumption. These exercises are the most effective of any in remedying this danger. The writer has seen cases where, by these and other exercises that follow for the same object, the waist has been enlarged two and three inches, and the width across the shoulders increased from three to five inches. Of course the size and action of the lungs were greatly enlarged.

EXERCISE 2.

Word of Command—"Lungs Expansion!"

Fig. 2.



Place the hands as in *Fig.* 2. Inflate the lungs as full as possible, and retain the air as long as possible. During the whole time beat smartly over the lungs, on each side, from the collar-bone downward to the lower ribs. Repeat the inflation *twice*, each time holding the air as long as possible, and beating the chest on the sides, and *not in the middle.*

This has great effect in enlarging the chest and lungs. The reason is that a large portion of the air-cells of the lungs are seldom filled, and so become shrunken. By this exercise the air is forced into them, and thus they are gradually enlarged, and come into habitual use.

Next let the pupils fill the lungs as much as possible, and then very slowly sing the music scale, first rising and then falling. Let the effort be to sing as low and as high as possible, and also to hold the breath as long as possible.

Use the words *Do*, *ra*, *mi*, etc. Repeat this *twice*. Then let them fill the lungs and sound a single note near the middle of the scale *as long as possible*. Repeat this *twice*. Let each try to hold on the longest. This exercise at once cultivates the voice and strengthens the lungs.

Exercise 3.

Word of Command—"Collar-bone Extension!"

Place the arms as at *Fig*. 3, having the hands open and palms together. Then throw the arms backward as far and as violently as possible, as at *Fig*. 4.

The great point in this exercise is to hold the arms as nearly as possible *perpendicular* to the body. When in this position they are thrown violently back, they *stretch the collar-bone* and flatten the shoulder-blades. This gives room to the lungs in front, enlarges the chest, and tends to cure round shoulders.

Let this be performed simultaneously by teacher and pupils, counting only when throwing the arms *backward*, till they have counted *forty*. The pupils must count aloud.

Fig. 3.



Fig. 4.



Exercise 4.

Word of Command—"Chest Extension!"

Place the arms as at *Fig.* 5, and then draw them violently into the position at *Fig.* 6. Count only when drawing the arm back, to *forty*.

The object of this is to stretch the collar-bone and flatten the shoulder-blades, and thus enlarge the chest.

Fig. 5.



Fig. 6.



In cases where there is a narrow and flat chest a great change will be made by these exercises for the lungs. In such cases, a *measurement* around the chest, at the point of the shoulders, and at the pit of the stomach should be made at first, and then repeated at the end of two or three months, for the purpose of marking this change. Persons with weak lungs and consumptive symptoms often may be cured by these exercises performed in the open air; but they must commence with caution and increase slowly.

EXERCISES TO PERFECT THE MUSCLES OF THE ARMS AND HANDS.

A round and perfectly formed hand and arm are deemed some of the most attractive points of womanly beauty. Although by birth some must necessarily be without these attractions, yet multitudes who now are entirely destitute of them might possess them by proper cultivation.

A course of training that shall develop *all* the muscles of the hand and arm *equally*, tends to produce roundness of outline, grace of movement, and purity and clearness of skin. Especially is this the case if all other portions of the muscular system are harmoniously trained.

Exercise 5.

Word of Command—"First Arm Position: Arms Forward!"

Fig. 7.



The exercise commences with standing in the military position, placing the closed hands with the backs against the shoulders, as in *Fig.* 7. Then, at the word "Arms Forward!" throw them forward as at *Fig.* 5, counting *one.* Then draw them back as at *Fig.* 6, counting *two*, and thus on to *twelve.*

The "*First Arm Position*" will be frequently referred to, and should be noticed particularly.

EXERCISE 6.

Word of Command—"First Arm Position: Arms Out!"

Fig. 8.



Place the arms in the First Arm Position, as at *Fig.* 7.

Then, at the word "*Arms Out!*" throw them out at the sides, as at *Fig.* 8.

Count *one* when throwing out the arms, and so on to *twelve.*

Fig. 9.



EXERCISE 7.

Word of Command—"First Arm Position: Arms Down!"

Place the arms in the First Arm Position, as at *Fig.* 7.

Then, at the word "Arms Down!" the arms are to be thrown downward, as at *Fig.* 9, keeping the hands closed.

Count *one* when throwing down the arms, and so on to *twelve.*

O

Exercise 8.

Words of Command—"First Arm Position: Arms Up!"

Fig. 10.



Place the arms in the first position (*Fig.* 7). Then, at the word "*Arms Up!*" throw them upward as at *Fig.* 10, opening the hands. This exercises the muscles that shut and open the hand, as the hands are to be open when up and shut when down.

Count *one* when throwing up the arms, and so on to *twelve.*

Fig. 11.



Exercise 9.

Word of Command—"Perpendicular Movement!"

Place the arms and hands, as in *Fig.* 11, about six inches from the face and body, and then change places, putting the *down arm* up and the *up arm* down.

Throw the up arm over the head, and *as far back as possible.*

Count *one* at the first movement, and so on to *twelve.*

EXERCISE 10.

Word of Command—"Arms Out: Rolling Movement!"

Both arms are to be extended forward (*Fig.* 12). Then the two hands, at the word "*Rolling Movement!*" both at once, are to be turned first upward and then downward, as in *Fig.* 13.

The hand must be turned as far as possible both ways. This exercises the muscles that roll the lower part of the arm.

Count *one* in turning the arm up, and so on to *forty*.

Fig. 12.



Fig. 13.



In all ordinary uses, when the arm is raised it should be with the palm down, as in *Fig.* 13. When pointing, or presenting an article, the arm should be turned *after it is raised*, with the palm upward. This is indispensable to a graceful use of the hand and arm.

Exercise 11.

Word of Command—"Shoulder Whirl!"

Fig. 14.



Place the right arm as at *Fig.* 14, and swing it forward in a circle. Then change, and swing it backward.

Be careful to stand in the Military Position, and make the arm describe a circle.

Count *one* on completing the first circle, and so on till twelve circles forward and twelve backward are completed. Then perform the same with the left arm. This exercise is very effective in *warming cold hands*, as it sends the blood downward.

Fig. 15.



Exercise 12.

Word of Command—"Elbow Whirl!"

Place the elbows on the hips, and hold them there. Then swing the lower arms in a circle, as at *Fig.* 15.

Swing them first outward, and then inward, till *twelve* are counted each way.

Fig. 16.



EXERCISE 13.

Word of Command—"Wrist Movements."

Place the wrists on the hips, and hold them there. Then move them around in a circle, as in *Fig.* 16, first outward and then inward, till *twelve* are counted each way.

Up, Down, and Side Wrist Movement.

Place the wrists firmly on the hips, with the hands open. Then, at the word "*Side!*" move the hands as far as possible to the right and then to the left, keeping the wrists firm on the hips, till *twelve* are counted. Then, at the word "*Up and Down!*" move them upward and downward as far as possible, still holding the wrists on the hips, till *twelve* are counted.

EXERCISE 14.

Word of Command—"Finger Exercise!"

Fig. 17.



Place the fingers of both hands as at C in *Fig.* 17, and then rest them on the points of the shoulders. Then throw *both* arms out, as is seen on the right side of *Fig.* 17, *spreading the fingers* as far as possible. The fingers are to be brought together on every return to the shoulders.

Count only on throwing out the arms, to *twenty*.

Exercise 19.

Word of Command—"Side Neck Movement!"

Fig. 23.



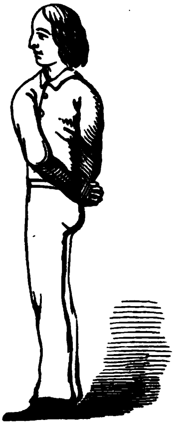
Place the head as at *Fig.* 23, and then throw it on to the other side in the same position.

Count *one* at the beginning, and so on to *six*. This should be performed slowly.

Exercise 20.

Word of Command—"Side Twist!"

Fig. 24.



Clasp the hands, interlacing the fingers as in *Fig.* 24. Then throw the arms as far behind as possible, and twist the body back as far as possible. The face and feet to be kept forward.

Count *one* at the first turn, and so on to *forty*. This is a very important exercise in strengthening the abdominal muscles. It should be performed with great force, but not fast.

Exercise 21.

Word of Command—"Oblique Neck Movement!"

Fig. 25.



Bend the head *forward* and *sidewise* to the *right*, and then *forward* and *sidewise* to the *left*, as in *Fig.* 25.

Count *one*, and so on to *six*. This should be done slowly, but the neck should be stretched as far as possible.

Exercise 22.

Word of Command—"Arm Thrust!"

Fig. 26.



Place the arms as in *Fig.* 26. Then alternately throw out the bent arm, and draw back the straight arm with great force.

Count to *forty*, and let the movement be quick.

Exercise 23.

Word of Command—"Back Oblique Neck Movement!"

Fig. 27.



Turn the head to the *right* sidewise and backward, as at *Fig.* 27, as if trying to look at the heels. Then turn it to the *left* sidewise and backward.

Count to *six*. Let the movement be slow, but stretch the muscles as much as possible.

Exercise 24.

Word of Command—"Forward Spine Exercise!"

Fig. 28.



Raise the arms and throw the body back, as in *Fig.* 28, having the hands open, and bending back as far as possible. Then throw the arms and body forward, as in *Fig.* 29, *keeping the knees straight.*

Fig. 29.



This should be done slowly, but with all possible force, trying to touch the floor with the fingers.

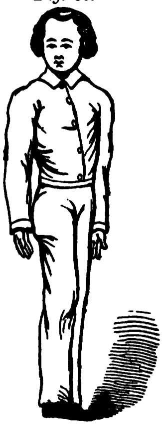
Count only when stooping forward, to *twenty*.

This is a most effective exercise in *remedying* curvature of the spine, as well as in preventing it.

EXERCISE 25.

Word of Command—"Body Twist!"

Fig. 30.



Place the body and arms as at *Fig.* 30, and then twist the head, arms, and body as far to the right as possible, and then as far to the left as possible, moving moderately.

Count *one* on turning to the right, *two* to the left, and so on to *twenty*.

EXERCISE 26.

Word of Command—"Backward Spine Exercise!"

Fig. 31.



Stoop the body forward a little, letting the arms hang, and closing the hands. Then throw the arms and body, as in *Fig.* 31, with the greatest force possible, as if striving to touch the floor behind with the hands.

Count only when throwing the body backward, to *twelve*. Move slowly, but with great force.

EXERCISE 27.

Word of Command—"Body Twist Forward!"

Fig. 32.



Fig. 33.



Place the hands as in *Fig.* 32, then stoop forward and turn the neck and body as far to the *right* as possible. Then turn the neck and body as far to the *left* as possible, still stooping, as at *Fig.* 33. Count *one* when commencing the movement, and so on to *twelve.* Move moderately.

Fig. 34.



EXERCISE 28.

Word of Command—"Body Twist Backward!"

Place the arms on the hips, as in *Fig.* 34, and then bend backward as far as possible. Then turn the head and neck as far as possible, first to the *right* and then to the *left*, moving moderately.

Count *one* when commencing the movement, and so on to *twelve.*

Exercise 29.

Word of Command—" Side Stoop!"

Fig. 35.



Place the body as at *Fig.* 35, striving to touch the floor with the hand, yet keeping the knees straight. Then stoop to the other side in the same manner.

Count *one* at commencing, and so on to *twenty*.

Exercise 30.

Word of Command—" Oblique Spine Exercise!"

Throw back the body and raise the right arm, as in *Fig.* 36. Then throw the body forward, as in *Fig.* 29 of the "*Forward Spine Exercise*," and try to touch the floor with the *right* arm. Let the other arm hang by the side. Then raise the left arm, and throw the body forward as before, and try to touch the floor with the *left* arm, while the other arm hangs by the side.

Fig. 36.



Before throwing the arm up throw it *backward*, and bring it upward so as nearly to describe a circle.

Count *one* when bending forward, *two* when bending the second time, and so on to *twenty*. This is a very important exercise.

EXERCISES FOR THE FEET AND LEGS.

The most important exercises for the feet are what are called the "*five positions.*" The chief object of this exercise is to give *strength*, *elasticity*, and *correct movement* to the feet.

In the first attempts the toes should not be turned out more than will admit of holding the body steadily. The pupil should *aim* at the position, but few will be able to perform them exactly according to directions. But all attempts are favorable to the muscular training of the feet.

In all these positions the body must be kept perfectly erect, the shoulders thrown back, the chest advanced, the elbows curved out from the sides, while the thumb and fingers should slightly catch the dress. See *Fig.* 37.

These exercises are indispensable as a preparation for easy and elegant *walking*.

Fig. 37.

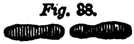


Exercise 31.

Word of Command—"First Position: Sink!"

Place the heels together, and throw the toes back so as to form a straight line, as at *Fig.* 37 and *Fig.* 38. At the word "Sink!" the pupil must bend the knees as much as possible *six* times, counting each time.

Fig. 38.



EXERCISE 32.

Word of Command—"Position Second: Sink!"

Fig. 39.



This position is formed by moving the right foot sidewise from the first position, about the distance of the length of the foot from the heel of the left foot, as at *Figs.* 39 and 40. Then the left foot must be drawn to the heel of the right foot. At the word "Sink!" the pupil must bend the knees as much as possible *six* times.

Then exercise the left foot in the same way. In performing this the instep of the foot that is extended should be *curved*, while the heel is raised and the toe alone touches the floor. The toe should be turned back as much as possible.

Fig. 40.

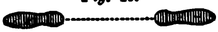


Fig. 41.



EXERCISE 33.

Word of Com.—"Third Position: Sink!"

Place the feet in the "Second Position," the right foot extended. Then draw the heel of the right foot to the ankle of the left foot, and rest it on the floor, as at *Figs.* 41 and 42. At the word "Sink!" the knees must be bent as much as possible *six* times. Next extend the left foot, and exercise it in the same way. Keep the toes out as much as possible, and the instep curved.

Fig. 42.



Exercise 34.

Word of Command—"Fourth Position: Sink!"

Fig. 43.



Take the "Third Position," and then move the right foot forward about its own length, keeping the toe back and the heel forward as far as possible. At the word "Sink!" the knees must be bent as much as possible *six* times.

Practice this with both feet. See *Figs.* 43 and 44.

Exercise 35.

Word of Command—"Fifth Position!"

Fig. 44.



Fig. 45.



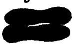
Take the "First Position," and then draw the heel of the *right* foot so that it shall, as nearly as possible, touch the toes of the left foot, as in *Figs.* 45 and 46.

When in this position bend the knees as much as possible *six* times.

After practicing these positions as here directed, let them be performed *in succession*, first with the right, and then the left foot, counting *one* to each movement, and so on to *six*.

The First and Fifth Positions must be practiced a great deal by those whose toes are turned too much inward.

Fig. 46.



Exercise 36.

Word of Command—"Semicircles!"

Fig. 47.



Place the arms as in *Fig.* 47. Rise on the toes, and at the same time lift the arms till the backs of the hands meet over the head. Then sink on to the heels, and let the arms fall to the sides.

Count only on raising the arms, to *twenty*.

Fig. 48.



Exercise 37.

Word of Command—"Upward Movement!"

Stand in the walking position. Then rise on the toes, and raise the arms as in *Fig.* 48. Repeat this *six* times.

Next rise on the toes of the *left* foot and raise the right arm, and then on the toes of the *right* foot and raise the left arm, and thus alternately *six* times.

Exercise 38.

Word of Command—" Sidewise Movement!"

Fig. 49.



Place the body and limbs as in *Fig.* 49, leaning to the *left*. Then change the feet, and throw them into the same position, leaning to the *right*.

Count *one* at the first movement, and so on to *twelve*.

Fig. 50.



Exercise 39.

Word of Command—" Downward Movement!"

Place the hands on the hips, rise on the toes, and then sink downward, standing on the toes, as in *Fig.* 50. Then rise, and stand with the foot flat on the floor.

Count *one* at the first movement, and so on to *twelve*.

Exercise 40.

Word of Command—"Low Sink!"

Fig. 51.



Place the hands on the hips, stand on the toes, and sink, as in *Fig.* 51.

Count only when sinking, to *twelve.*

This must at first be practiced with the feet flat on the floor.

Exercise 41.

Word of Command—"Side Stretch!"

Fig. 52.



Place the hands on the hips, bend the body as far as possible to the *right*, and straighten the left leg. Reverse the movement, and bend to the *left*, and straighten the right leg, as at *Fig.* 52.

Count *one* at the first movement, and so on to *twelve.*

Exercise 42.

Word of Command—"Forward Reach!"

Fig. 53.



Place the hands on the hips, and throw the body as far forward as possible, as at *Fig.* 53, first on the *right* and then on the left foot.

Count *one* at the first movement, and so on to *twelve*.

Fig. 54.



Exercise 43.

Word of Command—"Side Reach!"

Throw the body and stretch the right arm and right leg as far as possible to the right. Reverse the movement, and stretch them to the left, as at *Fig.* 54.

Count *one* at the first movement, and so on to *twelve*.

The following exercises are needed to complete the series. They may at first appear more suitable for boys than for girls.

But it will be found that girls are so impeded by their dress, especially if it be long, that *one half* of what is done by the boys fully secures an equal amount of exertion.

These exercises, therefore, may be reduced *one half or more* for the girls, and yet give equal exercise to the muscles.

Exercise 44.

Word of Command—"Up Stairs Movement!"

Fig. 55.



Hands on the hips. Raise the right and then the left knee alternately, as in *Fig.* 55.

Count *one*, and so on to *twelve*.

Exercise 45.

Word of Command—"Knee Bend!"

Fig. 56.



Hands on the hips. Raise the right and then the left foot alternately, till the heel presses the thigh, as at *Fig.* 56.

Count *one*, and so on to *twelve*.

Exercise 46.

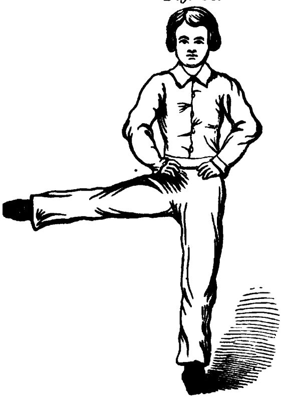
Word of Command—"Front Angle!"

Fig. 57.



Hands on the hips. Raise the right and left foot alternately, as at *Fig.* 57, counting to *twelve.*

Fig. 58.



Exercise 47.

Word of Command—"Side Angle!"

Hands on the hips. Raise the right and left leg alternately, as in *Fig.* 58, counting to *twelve.*

Exercise 48.

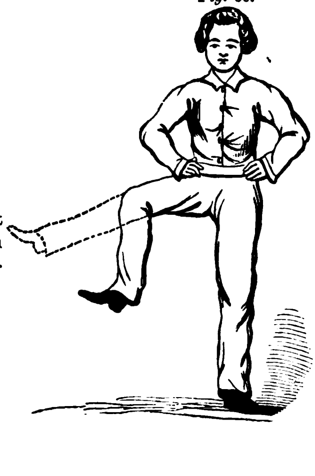
Word of Command—" Back Movement!"

Fig. 59.



Raise the right and left knee alternately as high as the hips, and then throw it backward, as at *Fig.* 59. Count to *twelve.*

Fig. 60.



Exercise 49.

Word of Command—

" Oblique Movement!"

Raise the right and left leg alternately, and then throw the foot out obliquely, as at *Fig.* 60.
Count to *twelve.*

Exercise 50.

Word of Command—" Cross Movement!"

Fig. 61.



Throw the right leg alternately across the other *in front*, as in *Fig.* 61. Then throw it across *behind* in the same way. Repeat the same with the left leg.

Count *one* to the front movement, *two* to the backward movement, and so on to *twenty*. Throw the limb as far as possible across the one supporting the body, both in front and behind.

Then Exercises 61 and 62, on p. 48 and 49, should follow. These two are among the most important.

Great care must be taken, in all cases, that the head be held erect in all the standing exercises.

SECOND COURSE—HALL EXERCISES.

CONSTRUCTION OF A CALISTHENIC HALL.

Fig. 62.

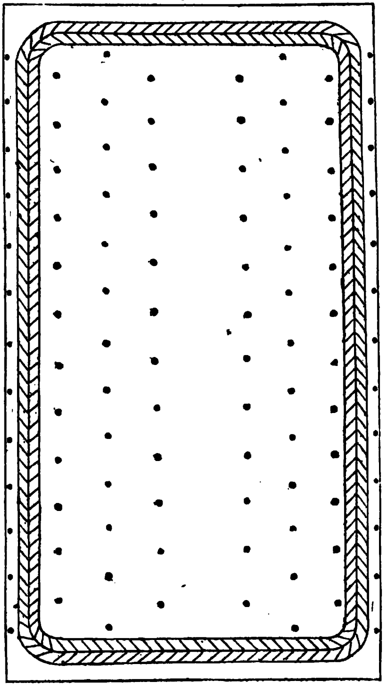
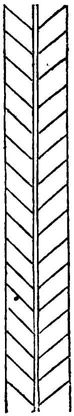


Fig. 62 represents a Calisthenic Hall on the scale of twenty feet to an inch. Around the outer portion is a walking-path. The dots represent *stations* for the pupils while exercising. They are to be made of bits of black walnut four inches square, inlaid. They are to be five feet distant, and arranged as in the drawing. Every pupil is to have her appointed station, so as to have no confusion in arranging for exercises.

WALKING-PATH.

Fig. 63.



In a properly constructed Calisthenic Hall there should be a *walking-path* on one or both of the longest sides of the room, or entirely around the room. It should be made of alternate boards of white pine and black oak, forming a path, as illustrated by this drawing (*Fig.* 63). The oblique boards are to be at angles of thirty degrees with the middle line, so that they form sixty degrees with each other. The middle line should be black oak half an inch wide. The oblique boards should be three inches wide. The path should be two feet wide.

Around the wall of the whole room should be seats. One portion of these seats should have lids in which to place the weights used.

Every pupil should make two oblong bags, six inches wide and from eight to twelve inches long, of unbleached cotton. These should be filled with *corn*, but not stuffed so as to be stiff. At one end of the hall should be two or three sets of perpendicular bars as described at page 51.

EXERCISES FOR THE CALISTHENIC HALL.

Let the tops of the windows always be down during exercise, for it is better not to exercise at all than to do it in impure air. All must be *dressed loosely.*

Let every pupil have a partner. Let the partners be named *numbers one* and *numbers two.*

If there are boys and girls, let the boys be *numbers one* and the girls *numbers two.*

Let these all be arranged in *four* divisions, placing the tallest in the first division and the smallest in the fourth division, and the medium sizes in the second and third divisions.

Let each division have two leaders, one for the *numbers one* and the other for the *numbers two* of that division. These are to be called the *First* or *Second, Third* or *Fourth Division Leaders.*

All the numbers *one* are called *First Section* of each divis-

ion, and numbers *two* are called the *Second Section.* In each division the partners are called *couples*, and are numbered *first* and *second* and *third couples*, and so on.

Of the several division leaders, the numbers one are to have charge of section one, and numbers two of section two of the divisions which they lead.

Each division is to have its quarter of the hall, and all the members of it are to have one of the stations marked on the floor in that quarter. Thus there are *Divisions*, *Sections*, *Couples*, *Leaders*, and *Partners Number One and Number Two.*

The classes are to form and pass into the Calisthenic Hall in order, the leaders each at the head of their sections. In performing the walking exercise they are to step out to notice the performance of their section. In other exercises the two leaders of each division are to place themselves in front of their sections, to set an example and superintend the exercises.

The teacher having charge of the Health Department will have the care of the training of the Division Leaders. In return, these leaders will train the sections committed to them in like manner.

In commencing the exercises with new pupils the first aim should be to have them perform the movements *exactly right.* The second aim should be to have the exercises performed with great *force* and *energy of will.* The more vigorous the movements the more benefit is secured. But great care must be taken not to proceed too fast, or do too much at first. There will be great diversities in strength among the pupils, and the teachers must take care that the delicate ones are not tempted to go beyond their strength by those more vigorous. Some of the exercises must always be slow.

Exercise 51.

Standing and Walking.

The pupils should form in division before entering the hall, as directed above, and then the first should be a walking exercise around the walking-path.

The sections should walk in single file. The leaders should walk on the inside of the path, and notice the walk of each of their section, in order to correct all defects.

Standing Exercise.

There are few things which more agreeably influence the appearance than the manner of *standing* and *walking*. A great majority both of men and women in this nation stand in an unnatural and inelegant posture; while the accomplishment of a light, graceful, and easy walk is as rare as it is beautiful. In some countries of Europe the art of walking with ease and elegance is much cultivated and esteemed, and in such countries the women are celebrated for their grace of person and movement.

Fig. 64.



The main object in the standing position is to place the body in such a position as that *every muscle and limb is in its natural attitude.* Thus every movement becomes both easy and natural, except when the body is distorted or misformed.

Walking Exercise.

This is the same as the military position, except that the arms are to be allowed to hang easily at the sides. The elbow is to be turned out a little from the sides, so as to give a slight curve to the arm. The fingers are to hang loosely and easily. See *Fig.* 64.

First. Take the *walking position*, throwing the weight of the body on to the front part of the feet.

Second. Extend the left foot, having the knee straight and foot turned out, the same as when standing, and the toe bent down by curving the instep a little, the same as at *Fig.* 65. on the following page. The body may be steadied by touching the floor slightly with the toes.

Third. Set the foot down gently, keeping the knee

straight, and then throw the weight on to the foot so that the pressure shall come first *on the ball of the little toe.*

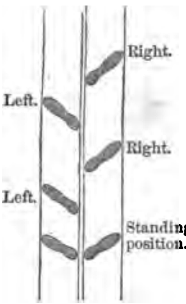
Fourth. Set the foot down so that it will be in a straight line with the point from which it is moved.

Fig. 65.



Set the right foot forward in the same manner, and each pupil say "left" or "right" as the foot is set down.

Fig. 66.



The distance of the steps apart must be *about that of the length of the foot.*

Here is a drawing representing footsteps on a walking-path (*Fig.* 66).

In a quickened step, the body is to be thrown more forward.

The following are the most common defects in walking:

First. Wrong positions of the body, such as the neck projecting, the back crooked, the arms drawn back or placed close to the sides, the feet turned either too much out or too much in. Any of these positions prevent a natural and graceful walk.

Second. A method of setting the feet too far apart. This makes what is called a *wiggling* gait.

Third. Turning in the toes too much. This makes what is called the *cow* walk.

Fourth. A habit of inclining the body toward the foot that is set down, instead of keeping it in a steady and upright position. This makes a *waddling* gait.

Fifth. A habit of lifting and bending the knees, instead of keeping the limbs straight. This makes what is called the *up-stairs* walk.

Sixth. A method of walking without lifting the feet. This makes a *shuffling* gait.

Seventh. Setting the foot down flat on the heel first. This prevents all grace and elasticity. For this reason no one can walk gracefully with heels on the shoes. Neither can any one walk gracefully who cramps the muscles with tight shoes.

The pupil should be made to imitate these faults till they are understood. They should march to music, singing appropriate tunes and words. This tends to strengthen the lungs.

Exercise 52.

Skipping Exercise.

The pupils should next learn to skip on the toes—at first very slowly, afterward to quick music.

Exercise 53.

Exercise with Weights.

Word of Command—"Take Weights!"

Fig. 67.



After the walking and skipping exercise, the boxes should be opened, and the pupils march in order, and take the weights, one in each hand. When all are thus furnished, they should march to music at the discretion of the teacher.

Fig. 68.



EXERCISE 54.

Word of Command—"Weights Out!"

Let the pupils carry the weights as at *Fig.* 68, marching to music.

Fig. 69.



EXERCISE 55.

Word of Command—"Weights Up!"

Let the weights be carried as at *Fig.* 69, still marching to music.

Fig. 70.



Exercise 56.

Word of Command—"Weights Balancing!"

Let the pupils keep time by changing the weights up and down as the teacher says "*left up! right up!*" This should keep time with the music.

Fig. 71.



Exercise 57.

Word of Command—"Weights on the Head!"

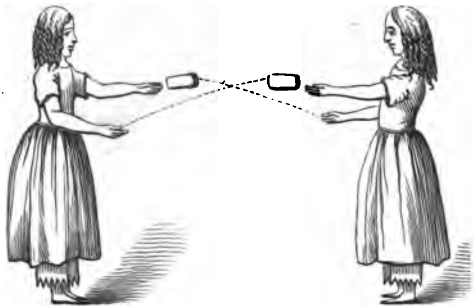
Here both the weights are to be *crossed* on the head, and the military position of the arms and body taken. Thus they are first to march to music, and when well trained they are to *skip* to music with the weights on the head. In skipping, the arms are to be held in the walking position.

Exercise 58

Word of Command—"Form Lines!"

Here the numbers 1 are to form a line and numbers 2 another, to face, and at the distance of four or five yards.

Fig. 72. *Fig.* 73.



Then they are each to take one weight and toss it with the right hand, and receive another with the left. Then they are to toss with the left, and receive with the right.

At the close of this they are to march to music and place the weights in the boxes.

Exercise 59.

Word of Command—"Form Divisions!"

After replacing the weights let the divisions and sections be formed in regular order preparatory to marching. Let the partners stand side by side, number *one* being at the *right* hand of number two, their arms hanging by their sides.

Exercise 60.

Word of Command—" Join Arms: March!"

Fig. 74.



Let number *one* take with the *left* hand the *right* hand of number *two* (which will be next him), and place it in his own right hand, and hold it while he puts his left arm forward.

Then let him draw the hand he holds into the position seen in *Fig.* 74. Then the marching to music follows.

This is a graceful mode of placing a lady's hand in the arm of a gentleman.

Exercise 61.

Word of Command—
" See-Saw!"

Let Numbers 1 take the hands of Numbers 2 so that the arms will cross, and the right hand of one will join the right of the other, and the left hands also unite, as in *Fig.* 75. Then let each pull the other as far as possible to the right, and then to the left, at each movement counting from *one* to *forty*.

Fig. 75.



Exercise 62.

Word of Command—"Double Stretching!"

Fig. 76.



Numbers 1 take the hands of Numbers 2, placing the toes at the heels, as in *Fig.* 76. Then the forward one must try to throw back the head, project the chest, and curve inward the back as much as possible. The one behind must stand firmly while the other rises and then falls forward *six* times. Then let them change places, and repeat the exercise. It should be the effort of the forward one to throw back the head and project the chest and abdomen as much as possible—far more than the drawing shows.

After these exercises, at the word "*Salute Partners!*" they are to courtesy or bow to their several partners, as here directed.

Mode of Bowing.

The boy is to stand in the walking position, and then bend his body toward the one he salutes till his head is about as low as his elbows are when standing upright.

Mode of Courtesying.

Stand in the walking position.

Slide the right foot a little to the right.

Draw the left foot a little behind, slightly resting it on the toe.

Sink on the right foot, and at the moment of rising throw a part of the weight onto the left foot, but return the full weight to the right foot when risen. In ordinary cases, a slight sinking on one foot is sufficient without any preparatory movement.

Practice the same with the other foot.

Then the pupils are to disperse to their several appointed stations, and go through with the "*School-Room Exercises.*" The leaders are to superintend and set the example, standing in front of their sections.

Then the divisions are to form the couples so as to join arms, as directed on p. 40 and 48, and thus return to the school-room.

EXERCISES TO CURE DEFORMITIES AND CERTAIN DISEASES.

There is no doubt that most of the deformities consequent on bad habits during growth, may be entirely remedied.

The author of this work has known of multitudes of cases in which curvature of the spine, distortion of limbs, and other very bad deformities have been entirely remedied by such exercises, while many diseases also have been thus cured.

But such cures can usually only be secured by the frequent, long continued, and *vigorous* practice of the exercises designed to promote such cures.

The following are directions for a course of select treatment for the several deformities indicated:

Projecting Neck and Crooked Back.

Fig. 77.



One of the most important exercises for the remedy of these deformities are the "parallel bars," as seen in *Fig.* 77.

The best way to arrange such bars is to have holes in the floor to sink them in, and corresponding holes in the upper wall. Thus they can be first inserted in the wall and then sunk just so far in the floor that they will hold at both the upper and lower ends.

Parallel Bars.

This exercise is especially for such as are crooked or round-shouldered, or both. It has great effect also in enlarging the chest.

Grasp the bars as in *Fig.* 77.

Then throw the body back as far as possible, and then forward with great force, trying to press the chest and abdomen as far forward as possible. This should be done many times, and with as much force as possible.

Never exercise so long as to make the muscles feel sore, nor so often as to prevent comfort through the day and quiet sleep at night.

The other exercises for this purpose are:

First, The "Lungs Expansion," and also Exercises 3 and 4. These tend to remedy the evil by strengthening the whole body with pure air and enlarging the lungs and chest. These should be performed six or eight times a day.

Next, Exercises 17, 22, 24, 26, 28, and 30. The most effective of any is Exercise 62. This should be performed many times a day, by opening a door, putting the hands behind, and grasping the knobs so that the door will be between them. The heels should rest against the door, the head be thrown back, and the chest and abdomen forward as much as possible.

Curvature of the Spine.

The principal Exercises to remedy this deformity are, first, the "Lungs Extension," and Exercises 3 and 4 to enlarge the lungs and chest, by increasing the amount of pure air inhaled, and strengthen the whole system.

To these add Exercises 17, 18, 20, 22, 24, 25, 26, 27, 28, 29, 30, and 62.

Flat Chest and Round Shoulders.

First the Parallel Bars. With this Exercises 2, 3, 4, 16, 17, 22, 24, 26, 30, and 62. The last should be done many times a day.

Turning in of the Toes.

Practice the Five Positions a great deal, *as directed.*

All kinds of Abdominal Weakness and Displacements.

All exercises that *raise the arms* are serviceable, and all that move the body upward, downward, or sidewise are especially so.

Exercises 2, 3, and 4, that expand the lungs and chest, are serviceable as strengthening the whole system.

To these add Exercises 8, 16, 17, 18, 20, 22, 24, 25, 26, 27, 28, 29, 30, 36, 37, 38, 41, 43, 55, 56, 61, and 62.

In case of great debility or disease, these exercises must be commenced with caution, practiced gently at first and only a few times, as it is found they can be borne without injury. Gradually increase the number and the vigor of motion.

Sitting baths and a wet compress around the lower part of the body are very important in all abdominal weaknesses or displacement.

Every person who has a crooked back or round shoulders will hasten a cure by sleeping flat on the back with only a bolster.

It has been shown that the abdominal muscles run upward from the pelvis to the breast-bone, and sidewise from one hip to the other, and also obliquely. These are the chief supporters of the intestines, so that when the many causes of debility affect them, as well as the rest of the body, they become weak and flabby, and thus the whole interior organs sink downward and often become displaced, while the whole outline of the body is altered.

It has been found practicable, by the exercises here indicated, not only to give strength to these debilitated muscles, but to restore entirely the proper form without and within.

WATER CURE TREATMENT FOR FAMILIES.

There are some of the methods of the Water Cure treatment that all physicians will allow to be perfectly safe, while they are valuable substitutes for dangerous and generally poisonous medicines. Most diseases or deformities are cured quicker by the union of the simpler processes of the Water Cure than by either method alone.

In most families the medicine chest is most frequently visited in cases of colds, constipation, or diarrhea. These methods are far safer and better than medicine.

TREATMENT FOR A COLD IN THE HEAD.

On going to bed, cover the head, face, and neck with a wet towel, leaving a small opening, enough to breathe freely, around the mouth and nose. Cover this with a small woolen blanket so as to keep the head and neck very warm. Keep up a gentle perspiration during the whole night. In the morning wash the head, face, and neck with cold water. Dry the hair, or keep the head from cold till it is dry.

If too much trouble is made by wetting the hair, treat the face and neck thus.

TREATMENT FOR A COLD ON THE LUNGS.

Pack in a sheet wet in water at 80 for three quarters of an hour at 11 A.M. Wash off in water at 70.

At night, just before going to bed, take a hot sitting bath, with feet also in hot water at 110, for fifteen minutes. Wash off in water at 70. Wear a wet bandage over the chest all night, and keep up a gentle perspiration. Hot fomentations of the chest on retiring are very efficacious. In most cases of colds, at their commencement, either in the head or on the lungs, a *hot bath* on going to bed, to start a perspiration to be kept up through the night, will cure. Wash in cool water in the morning.

The *certain* cure of a cold in the head or on the lungs depends on treating it *immediately*. If it is allowed to run on a day or two, the above treatment will palliate and shorten the evil, but, if taken at the commencement, it will stop it entirely.

These methods open the closed pores and draw the blood to the skin, and thus relieve the internal organs.

TREATMENT FOR CONSTIPATION.

Eat coarse bread and cooked fruit. Drink three tumblers of water before breakfast, and two on going to bed. Exercise a great deal in pure air, and sleep in the same. Solicit nature by efforts at a regular time directly after a meal. If this does not avail, use cool water injections—half a pint at once, after breakfast and on going to bed—the last to be retained if possible.

TREATMENT FOR BILIOUSNESS.

A pack in the wet sheet at 11 A.M. for three quarters of an hour, to be followed with a washing of the whole body in water at 72. Keep the head cool with a wet cloth.

At 4 P.M. take a hot bath (either sitz or full bath) at 110 to 120, followed by a wash in cool water at 80. Keep the head cool. [Hot fomentations over the liver are often very useful.] Drink from four to six tumblers of cold water before breakfast. If the stomach is too irritable for this, drink warm crust coffee. Wear a wet bandage around the body over the liver, covered with a dry double bandage, and exexcise in the open air, but not to great fatigue.

TREATMENT FOR CHILLS AND FEVER.

In cases where chills and fever occur, this method of using water will be found effective.

In the *fever*, pack in the wet sheet from ten to thirty minutes. Use water at 72 to wet the sheet. Wash off in water at 80. If nauseated, use warm water as a vomit.

In the *chill*, take a hot sitting bath with feet in hot water from one half to three quarters of an hour, keeping the head cool with a wet cloth on the head.

If the fever is high, repeat the packing every half hour

till it is reduced. No danger at all in this. Wash off in cool water, and rub well. Exercise in the open air, but not to fatigue. Sit and sleep in a cool and well-ventilated room, and keep on enough clothing to prevent chilliness.

TREATMENT FOR DIARRHEA OR DYSENTERY.

Stop eating entirely, that the irritated intestines may rest. If the stomach is not irritable, drink cold water often—a third of a tumbler at once. Take a sitting bath twice a day at 70, following it by friction of the skin. Wear a wet bandage around the abdomen, and keep from any chills by enough clothing. After every passage from the bowels take an injection of cold water at 65. Use for food gruel of coarse wheat; in dysentery, some mucilaginous drinks like gum Arabic or slippery-elm tea.

In case of fever, pack in the wet sheet half an hour, using water at 75.

Every physician will say these methods are *safe*. Try them before going to the medicine chest.

If a thermometer is wanting, "take the chill off" from the coldest water by adding say a quart of boiling water to a pailful of very cold water, and it is about at 65; say another quart will make it 70 or so.

If these prescriptions fail, do not trust your own skill, but send for a physician.

DIRECTIONS FOR WET COMPRESSES, PACKING, BATHS, AND FOMENTATIONS.

The Wet Compress.—The *wet compress* is a most valuable mode of relief for a great variety of aches and pains. The *backache* is, in multitudes of cases, relieved by a wet bandage around the abdomen and small of the back. The compress should be double diaper, covered with double cotton flannel. It should be wrung out in cold water as soon as dry, and scalded at least once a day in order to remove impurities discharged through the skin. Be sure and *keep warm*, especially where the compress is placed.

For Packing.—Spread on a bed, first, a thick cotton comforter; over that a woolen blanket, and over that a piece

of linen sheet which is only long enough to reach from neck to ankles, and which is wrung out in cool water. Wrap the patient first in the sheet, not putting it on the feet, and then draw the blanket and tuck it closely all around, especially about the neck, to keep out the air. Then do the same with the comforter. If the room is cold, use two comforters. This process, if repeated, will always reduce *any* fever for the time, even if it can not remove the cause. A tight linen dress, with a piece of oiled silk large enough to wrap the whole body, is very convenient for packing. It saves the need of any close wrapping or thick bed-clothes.

For the Sitz Bath.—Take a wash-tub, and put in water enough to cover the hips. Wear a warm, loose garment, and, if cold, a blanket over. Rub the parts immersed.

For a Foot Bath.—The water in this bath should not come quite up to the ankle-bone, and the feet should be constantly rubbed together. It often relieves a headache, if protracted for half or three quarters of an hour.

Fomentations.—A wet linen compress, with dry cloth over, and a tin vessel or bottle filled with hot water, placed so as to keep the compress warm, is the easiest method. Another method is to keep water hot on the fire or stove. Dip cloths in, and wring them out by putting them in a towel and wringing that. The compress should increase in heat every time till it is as hot as can be borne.

Every use of hot water should be followed with cold, to prevent debility of the skin.

In the water treatment, in *no case* is water to be used very cold at first. A preliminary process of several days, in which the water is made a little cooler each day, is indispensable. In severe disease no person should adopt the water treatment except under the guidance of a physician who has had experience in it; for it is a very powerful agency, requiring skill and experience in such cases.

In reference to the use of medicine, every person must perceive there has been a great change among physicians. Every year there is less and less reliance placed by them on medicines thrown into the body, whose chemical and vital processes are so complicated and mysterious, while more

and more resort is had to the restorative influences which Nature herself provides when the laws of health are properly obeyed.

Those physicians that not only examine the pulse and tongue, but attend to diet, ventilation, and the care of the skin, and insist on fresh air and abundant exercise, find that the prescriptions to the apothecary are constantly diminishing.

The public are beginning to test the skill of their medical advisers by this standard.